Minutes of the IHRA Steering Committee
November 7, 1997
U.S. Mission
11 Rte de Pregny
1292 Chambesy Geneva

Attendees:

Australia	Keith Seyer
Belgium (DG III)	Herbert Henssler
Canada	Ian Noy
France	Jean-Pierre Medevielle
Germany/EEVC	Bernd Friedel
Hungry	Sando Szabo
Italy	Claudio Lomonaco
Japan	Kazuyoshi Matsumoto
	Yoshyuki Mizuno
Netherlands	Gerard Meekel
Poland	Wojciech Przybylski
Sweden	Kare Rumar
United Kingdom	Keith Rodgers
United States	Ray Owings
	Joseph Kanianthra
	Linda O'Connor

Agenda Items:

Review of Last Minutes
Industry Representation
Working Group Status Reports by Lead Countries
16th ESV Conference
Next Meeting

Welcome:

Dr. Raymond P. Owings, Associate Administrator, Research and Development, United States called the meeting to order. Dr. Owings, gave a brief recap of the objectives of IHRA and reconfirmed the United States' commitment to the program. He outlined the objectives of the November 7 meeting -- review and approve the priority research plans, approach for presenting status reports during the 16th ESV Conference, developing a common format (as applicable) for the research plans, and clarification on operating procedures.

Last Meeting Minutes

Ms. O'Connor reviewed the May 7 minutes with the Committee. The minutes were accepted as written by the Committee without change. Several Committee members noted that the transcript

from the May 8 Public Meeting contained some errors. It was agreed that the Committee members could suggest the changes to the Transcript to accurately reflect what was said. These changes are to be submitted to Ms. O'Connor. After receipt of all changes they will be incorporated in the NHTSA Public Docket File. Mr. Matsumoto noted that Japan had not received the materials from the May 7 & 8 meeting. A copy of the material was given to Mr. Matsumoto during the meeting.

Industry Representation

After a lengthy discussion on how many, and at what level non-government participation should be, the Steering Committee agreed to the following language with respect to non-government participation on the Steering Committee and within the Working Groups. This policy was agreed to taking into consideration that some non-government technical contributors are already serving on various Working Groups, that the Working Groups should be manageable in size, and that the process should remain transparent.

Subject: Non-Government Representation on the IHRA Steering Committee and on the IHRA Working Groups

On November 7, 1997 the IHRA Steering Committee adopted the following policy regarding the subject:

STEERING COMMITTEE:

(1) Participation will consist of Government Representatives only from participating Countries.

(2) To ensure transparency the Committee further agreed that:
(a) minutes of the Steering Committee meetings will be placed in the NHTSA Public Docket File,
(b) committee members will report on the deliberations of the Steering Committee in appropriate forums within their own country/organization, and
(c)public meetings will be held to report on research and other matters as needed.

WORKING GROUPS

(1) Non-government technical contributors permitted.

(2) The International Organization of Motor Vehicle Manufacturers (OICA) should be charged with nominating industry technical contributors to the five Working Groups.

(3) A letter be written to OICA notifying them of the Steering Committee's decisions. This letter will serve as a response to OICA's May 16, 1997, request that an industry representative be permitted to attend the IHRA

Steering Committee Meetings as an observer. In this letter, OICA will also be asked to nominate a total of up to three representatives, one from each major block -- Asia Pacific, Europe, and North America, to serve on each of the five Working Groups. OICA will be informed, in the same letter, of the industry representatives currently serving on the Working Groups so that they may either be regularized or alternate nominees be provided to serve on the Working Groups.

(4) The Working Group Chairperson has the right to invite additional technical contributors, as needed. In the areas of Advanced Frontal and Vehicle Compatibility, recommendations for additional technical contributors must be done in consultation with the Lead Country/Organization.

LEAD COUNTRY STATUS REPORTS

(Copies of individual reports attached)

Intelligent Transportation Systems (ITS) -- Dr. Ian Noy, Transport Canada, reported that the Public Workshop and Working Group (WG) meetings which were held in Berlin, Germany, October 24 and 25, 1997, respectively, were productive and informative, but an agreed upon work plan had not been fully developed. He further stated that the ITS program is far more complex than originally thought, and the WG had difficultly focusing on the work plan due the complexity of the subject and different view points. Dr. Noy indicated that rather than trying to develop a process to evaluate technology being developed by manufacturers, that the ITS WG would develop a process that can be used as a guideline by manufacturers when producing advanced technology. It is believed this is the best approach as technology changes too rapidly to try and address guidelines for individual components. He further stated that the burden of proof to ensure technology developed does not degrade driver/vehicle safety should be placed on the manufacturers. Dr. Owings asked Dr. Noy if there were any major concerns in his WG. Dr. Noy responded that he was concerned about the willingness of members to devote resources above the WG is not clear, and that the Steering Committee needs to address this issue. Kare Rumar from Sweden stated that while the Steering Committee cannot promise dollars, but good arguments can get the resources needed, and that is the SC's responsibility -- to make good arguments within their respective organizations to get the resources required.

Pedestrian Safety -- Mr. Kazuyoshi Matsumoto, Ministry of Transport, and Mr. Yoshiyuki Mizuno, JASIC, reported that the first WG meeting, held July 15-16, 1997, in Tokyo, Japan, was productive. Several key points include the accident analysis data should be available from each country next Spring, the biomechanics dummy development needs several years, so its is advisable to start based on the component tests that have been adopted by ISO and EEVC, the WG experts will meet approximately twice a year and each country involved has been asked to host. Mr. Matsumoto and Mr. Mizuno asked the SC for a clarification on "passenger vehicles" as this was an outstanding issue within the WG. T**he Committee agreed to the following definition -- Vehicles weighing up to 10,000 lbs. (4500 kg) GVW and up to 9 passenger seating.** Dr. Friedel mentioned that there was some concern that

ACEA was negative on the Pedestrian Safety project. Mr. Matsumoto and Mr. Mizuno, assured the Committee that this matter was resolved during the meeting, but also stated that a re-emphasis by the SC within the organizations/countries would be helpful. It was further agreed that the Pedestrian Project would be a vehicle based program rather than an educational program, however, both types of data files would be examined. Dr. Owings asked if there were any major concerns, of which two were mentioned. More time is needed to develop a program plan and it was critical that the countries involved provide Japan with crash data.

Biomechanics -- Dr. Joseph Kanianthra, NHTSA presented the report for the United States. The first meeting was held on September 22, 1997, in Hanover, Germany. During this meeting, the WG group agreed on the six research areas -- frontal impact, side impact, whiplash, child dummies, data harmonization and exchange, and computer modeling. Dr. Kanianthra asked the SC for approval to add side impact as it was not part of the original IHRA plan. The SC had no objection to adding side impact as part of IHRA. Dr. Kanianthra provided the Committee with a Biomechanics program development plan and asked that countries volunteer to take responsibility for items of specific interest to them outlined in the plan. No decision were made during the meeting, but the SC agreed to study the document further and provide feedback. Dr. Kanianthra further stated that a detailed program plan would be developed after reviewing input from other countries.

Advanced Frontal -- Dr. Claudio Lomonaco, Italian Ministry of Transport, reported that the first WG meeting took place in Rome, Italy, September 29, 1997. Three major program goals were set for the WG -- Presentation of the first report which will contain the necessary research and the program plan focused on the technical standard of frontal crash protection at the 16th ESV Conference, completion of the technical standard project and validation program by the end of 1999 or early 2000, and reporting the research findings at the 17th ESV Conference. During this meeting is was also agreed there are two main developing activities currently underway. In Europe the Parliament has given mandate to the EEVC to review the present Directive on Frontal Collision, and in the US the Congress has given mandate to NHTSA to go through a short/medium term activity to explain the feasibility of amending FMVSS 208 to harmonize it with the European standard. A longer term activity is also underway to develop a specific US frontal impact test. Dr. Lomonaco also stated there are other interested delegations within the EU/DG and the possibility of some opposition. Mr. Lomonaco requested the participation of Japan and Australia in the various tasks of the research program. Japan stated they would need to confer with their authorities and get back to Mr. Lomonaco and also inform the United States IHRA Secretariat. Australia agreed to participate as indicated on the full report attached. The next WG meeting is tentatively scheduled to take place in Madrid in January. Dr. Friedel requested that the WG status report be clarified in the Presentation of the Research Activities so there would not be confusion relative to the EEVC work and the EURO NCAP program. Also, Dr. Friedel will check on the status of Mr. Hobbs as a delegate to the WG.

Vehicle Compatibility -- Mr. Keith Rodgers, Department of Transport, United Kingdom gave the status report. Two WG meetings have taken place in June and October 1997 respectively, with a third meeting planned for Madrid in January. Not all countries have identified delegates to serve on this WG. Mr. Rodgers encouraged those not currently represented to notify him of the names of the delegates to

serve on the WG. Thus far the group has examined research activities taking place in different countries and it appears as though the United States has a more extensive research activity underway on this topic compared to the European countries. It was also noted that vehicle fleet mix will be an issue to deal within the group. Problem identification is currently a problem for the WG. The group is currently developing a work plan, and Mr. Rodgers believes the US FE modeling which is being made public will help with the program. Mr. Rodgers noted that there appears to be duplication of efforts between the IHRA activity and the EEVC WG 15 research which is also examining Vehicle Compatibility. EEVC by-laws prohibit non-member active participation. Mr. Rodgers has requested the EEVC's approval to hold three meetings to alleviate the duplication problem -- a closed meeting of the EEVC WG15, an open joint meeting with EEVC WG15 and the IHRA WG and a closed meeting of IHRA WG. He is currently awaiting approval from the EEVC. Mr. Rodgers was requested to expand/clarify in the full status report the EEVC WG15 representation. Mr. Seyer indicated that Australia had funding for vehicle compatibility but to date no decision has been made as to where or how the resources would be used.

Functional Equivalency (FEQ) -- Ms. Linda O'Connor, Dr. Joseph Kanianthra, and Mr. Keith Seyer presented the FEQ status report. Ms. O'Connor gave a brief history of actions taken to date, including the last meeting in which the SC agreed to defer making a decision on forming a working group until the Steering Committee meeting on November 7. It was further explained that the process developed in concert with Australia was not intended to circumvent any other activities taking place internationally in the area of functional equivalency. The objectives of bringing FEQ to the attention of the SC at this meeting, was to get it accepted by the IHRA SC if it was deemed appropriate, try to answer any technical questions, and have the item removed from the agenda. The United States has now been petitioned under its rulemaking process to make a determination of FEQ on several of its motor vehicle regulations. The U.S. will shortly be publishing an amendment to Part 572 of its CFR to incorporate the FEQ Process and the use of this process to make in determining FEQ. The Steering Committee, having offered no comments on the process which was announced in November 1996 to the SC, rendered the decision that FEQ should not be included as part of IHRA, that an international working group and the resources necessary to establish such a group should not be formed, and that FEQ should no longer be part of IHRA. This recommendation was approved by the Steering Committee. The Steering Committee did not approve nor did they disapprove the discussion paper and proposed process prepared by the U.S. and Australia.

16th ESV Conference -- Ms. O'Connor provided the Committee with an update on the record number of abstracts received for the Conference -- 300, that the letters notifying the authors were sent the week of November 2, for the first time Poster Sessions will be incorporated into the Conference, and the IHRA status reports will be the first report presented at the appropriate technical sessions. The lead countries were asked if they were planning to hold WG meetings during the conference time period, and to notify Ms. O'Connor as soon as possible so Canada may make the appropriate arrangements. Mr. Rodgers responded that his WG would be meeting but arrangements had been made to hold the meeting at a location other than the Conference site.

Work Plans -- Dr. Owings made a recommendation that where possible, the IHRA status

reports/work plans should share a common format. It was further suggested and agreed that the Status Reports will be prepared by the lead countries and forwarded to the United States by March 31, 1998. The SC will review the documents and e-mail or fax any comments to the U.S. by April 15, 1998.

SC Minutes -- It was also agreed that the minutes of this meeting will be circulated to the SC members for review and comments. That comments must be received by the IHRA Secretariat within one week after receipt.

Next Meeting -- It was agreed the next Steering Committee meeting will be held in Windsor, Canada, Sunday May 31, 1998, from 12:00 - 4:00 p.m. The U.S. will host a working lunch.

Prepared by Date:
Linda L. O'Connor, IHRA Secretariat

International Harmonized Research Activities - Intelligent Transport Systems
Working Group Meeting
October 25, 1997. Berlin, Germany

Minutes

Attendees:

Dr. Ian Noy (Chairman, Transport Canada, Canada)
Mr. Daniel Augello (Renault, France)
Dr. August Burgett (NHTSA, U.S.)
Dr. med. B. Friedel (BASt, Germany)
Mr. Geoff Harvey (Department of Transport, U.K.)
M. Lies Duynstee (Ministry of Transport, The Netherlands)
Dr. Anthony Ockwell (Federal Office of Road Safety, Australia)
Mrs. Annie Pauzié (INRETS, France)
Mr. Roland Niggestich (Federal Ministry of Transport, Germany)
Mr. H. Peters (TÜV, Germany)
Dr. Wojciech Zdzislaw, (Motor Transport Institute, Poland)
Mr. Kaneo Hiramatsu, (JARI, Japan)
Mr. Ray Kieffer (GM, U.S.)

1. **Introduction.**

On behalf of the WG, Ian Noy thanked Mr. Niggestich of the Federal Ministry of Transport, Germany for hosting the workshop and the meeting of the Working Group and Dr. Friedel for making the necessary arrangements.

The meeting began with a general discussion of the workshop [*A synopsis of the workshop is attached*]. While several different approaches to evaluation were presented at the workshop, it was difficult to extract procedures (methods and criteria) that could be directly used for safety evaluation. The purpose of the meeting was to develop a detailed workplan for collaborative research. However, different points of view regarding the role of the WG and about the nature of collaboration prevented that objective from being fully met. Nevertheless, a number of important activities have been defined, as described below. [*My note: In order to help focus on the role of the WG and defining collaborative research needs, I have prepared the attached brief discussion document. It is intended to stimulate discussion and does not necessarily represent the views of all WG members.*]

The discussions, summarized in the following points, reflect the complexity of evaluating ITS safety as well as differences of opinion regarding the nature of WG direction and deliverables.

- Some felt that governments should not test safety after-the-fact, but should work in cooperation with industry during product development. While industry/government cooperation is in fact underway in some

countries, it does not address the need for governments to develop intervention strategies for products that may increase the risk of collision.

- It is difficult to assess safety prospectively, especially as safety is not well understood despite decades of research in related fields (such as traffic management, effects of drugs). There is a need for more baseline data about driver behaviour. Others pointed out that many ITS products are very near market introduction and there is an urgent need to define safety indicators, although it did appear that safety indicators could be elaborated or agreed (e.g., there was a reluctance to put forward indicators such as "glance time to IP" or "time headway" since these are context and driver dependent).

- The issue of ITS safety is extremely complex and many felt the mandate of the WG is too ambitious, as stated. Moreover, the feasibility of developing generic procedures was questioned and a suggestion made that specific technologies should be addressed individually.

- Some felt that the WG should develop guidelines for convenience products and detailed requirements for collision avoidance systems (CAS). Some felt we should target our efforts to develop a code of practice with guidelines for design.

- Some expressed a need to continue the workshop concept, but to place emphasis on procedures. Others indicated we need a critical review of the state of the art. This will be addressed to some degree by the survey and future workshops.

- Techniques such as simulation may be good developmental tools, but may not be appropriate for final test and evaluation (e.g., certification).

- It was pointed out that industry employs a number of tools during the development of a product. Also, ISO and other groups are working on minimum performance requirements for specific systems (e.g., MMI, ACC) and these should address issues concerning interoperability and consistency of operational characteristics (such as minimum headway, deceleration rate and speed range of operation).

- The question of content-oriented requirements versus process-oriented requirements was raised. A content oriented requirements specifies the test procedures and criteria to be met. It could be as simple as a checklist with performance indicators or an elaborate test protocol using simulation or on-road tests. In a process oriented requirement, the issues are enumerated along with possible evaluation techniques. Manufacturers must demonstrate that they have used appropriate techniques to address issues of safety during the R&D cycle. The process requirement would also address the qualifications of the individuals

involved and the corporate process for incorporating results in the final design.

2. Activities

2.1 Survey.

A draft survey form was distributed and discussed. It was decided that the survey will be confined to automotive research (i.e., will not include aviation, etc.). It was agreed that final editorial comments would be sent to Ian Noy by November 13. The final survey will incorporate comments received from WG members and be faxed and sent electronically to WG members (and GFP for countries not represented in the WG) for completion. The WG member or GFP is responsible for assembling the set of completed forms for each country and forwarding the set to Ian Noy by February 1, 1998. These will be used to create a database which will be made available to WG members.

At its next meeting, the WG will decide how the database will be evaluated. An initial analysis will be made by Transport Canada and submitted to WG members.

2.2 Guidelines

Several guidelines have been developed by different organizations (e.g., UK Code of Best Practice, draft German guidelines submitted to WP29, MISRA guidelines, guidelines developed under GEM and similar EC projects). The WG agreed to review all of these guidelines with a view towards determining their usefulness in the development of content or process requirements. All agreed to forward guidelines to Ian Noy by the end of December. [*Note: ISO TC22.SC13/WG8 is developing a standard on "suitability of TICS" which could also be important for this WG*]

TC will undertake a review of process oriented guidelines to determine their potential utility for the WG.

2.3 Framework

It was agreed that the work of the WG is to develop a framework for evaluation. As the first step towards the WG agreed to consider the matrix contained in the paper by Louis Tijerina, "An Approach to Comprehensive Evaluation of Lane Change Crash Avoidance Systems", that listed possible evaluation techniques against a set of relevant safety issues. This matrix could be expanded to include issues raised at the workshop that are not reflected. Once such as framework is agreed, the elaboration of the techniques would be assigned to different members of the WG.

Other evaluation frameworks may have been previously developed under Drive II and similar programs. It was therefore agreed to obtain other

such material in order to ensure that the framework considered by the WG is as comprehensive as possible.

It was agreed that each member of the WG will examine the matrix and provide comments. Specifically, the comments should identify safety-relevant issues not addressed by the matrix, suggest the inclusion of additional techniques that are relevant but are not presently included, and any techniques that may be included but are not considered valid. Comments are due by the end of February.

2.4 Inventory of Projects

An important aim of the WG is to facilitate collaboration in relevant research. One way to accomplish this is to match members' research interests with research projects underway in different countries. For example, it might be useful for the Dutch researchers to find a project in another country to further test and develop the PC-checklist. Similarly, VTI may wish to simulate a specific scenario being researched using closed-track techniques in another country to examine questions of validity and calibration. In order to accomplish this, it was agreed that all members provide descriptions of research projects within their country which are open to collaboration. These projects do not necessarily need to be directly sponsored by government, but the sponsors must be willing to collaborate. These descriptions are due by the end of December. The length of the descriptions is left to discretion of WG member submitting the project but should be sufficiently detailed so that others can identify potential hooks for their interests (e.g., how they could link).

Ian Noy will distribute these descriptions to WG members in early January. WG members will then review the set of projects, discuss them with appropriate national researchers and identify the projects on which they are interested to collaborate. They will select projects that they can complement with a new technique or contribute unique competences. Resources for this collaboration will be the responsibility of the party wishing to collaborate.

3. Future Meetings

The next meting of the Expert Group was tentatively scheduled for March 26-27, 1998 in London. The meeting will commence at 13:00 hrs on Thursday and end at 15:00 hrs on Friday. A further meeting of the Expert Group will be scheduled in conjunction with ESV98 in Windsor, Canada. Publication of the results of the survey will be targeted for ESV98.

4. Action items

- August Burgett to send Ian Noy elaboration of survey Q 1.5 by Nov 13, 1997
- All WG members to send me comments on survey by Nov 13, 1997
- All WG members to send description of current projects that are open to collaboration by Dec 31, 1997
- Kaneo Hiramatsu to provide JAMA guidelines by December 31, 1997
- Geoff Harvey to provide UK code of best practice, MISRA and GEM guidelines by December 31, 1997
- Dr. Friedel to provide copy of German guidelines by December 31, 1997
- Lies Duynstee to summarize Dutch PC-based checklist by December 31, 1997, assuming results will be available, and to determine if software can be shared with WG.
- All WG members to complete survey and submit by Feb 1, 1998
- All WG members to identify current projects they can contribute to by Feb 28, 1998
- All WG members to provide comments on framework by February 28, 1998

5. List of Attachments

1. Synopsis of Workshop
2. Framework from paper by Tijerina, *An Approach to Comprehensive Evaluation of Lane Change Crash Avoidance Systems*
3. Informal doc. No 5, to WP29, *Information and Communication Systems: Safety and MMI.*
4. Japan's Safety Guideline on In-Vehicle Display Systems
5. Discussion Document
6. Survey

Synopsis of Workshop on ITS Safety Test & Evaluation
Ian Noy

The workshop technical program is attached. There were many good presentations covering a broad range of evaluation techniques - too many, in fact, for meaningful in-depth discussion. Some of the techniques presented are summarized below. Many important aspects of evaluation were raised that are not immediately apparent. For example, the need to consider the impact on non-equipped vehicles and the influence of driving style on test results are important considerations in the evaluation of safety.

Several European projects have attempted to address this topic, with limited success due to lack of continued funding. Specifically, Drive II projects (HOPES, HARDIE, EMMIS, and GEM) attempted to prepare frameworks, guidelines, and methodologies for safety assessment of in-vehicle systems. They collected a lot of data and developed, manuals, database, and tools such as Skill Acquisition Network (SANe) and Dialogue Design and Evaluation Method (DIADEM). However, the results of these efforts have not addressed safety per se, they lack full scale context and employ too many measurements. Continuation of these types of studies have not been supported by EC.

Summary of techniques presented

1. Usability testing using field operational tests, including de-briefings and focus groups (ref: UMTRI ACC study, J. Sayer). A feature of the data acquisition system was identification of events of interest (e.g., lane change) and capture of video data prior to and following event. The importance of collecting baseline data by individual parameters (e.g., age) was emphasized.

2. Field operational tests (ref: PSA Peugeot Citroen study of ICC, Florence Nathatn). Collected numerous additional data in addition to human factors data, to facilitate communication with engineers. Raised the issue of effects on drivers of non-equipped vehicles and other road users. Also indicated the need to include individual difference parameters such as driving style.

3. Open-road evaluation using behavioural and verbal protocol analysis to obtain insight into driver strategic behaviours (ref: INRETS/Renault study, F. Saad). Researchers analyzed general behavioural data as well as specific lane change manoeuvres. Concluded drivers of ACC-equipped tend to exhibit fewer manoeuvres and greater left lane driving. Also showed an overall reduction of time headway with ACC. However, when performing lane change manoeuvres, time headway depended on traffic conditions (higher with ACC under lighter traffic and higher when pulling out to pass with ACC). Concluded that situational variables and driving style are important factors.

4. Simulation for prospective evaluation of safety (ref: Lena Nilsson). A major point raised was the need to look at the individual road user as well as effects on traffic and society (as filtered through the traffic system). However, we do not have an adequate understanding of safety and therefore must rely on surrogate measures.

5. Computer-based checklist (ref; Karel Brookhuise). The development of a relatively quick prospective assessment of IVIS was described. This is still under development in the Netherlands.

6. Secondary task methodology to assess mental demand in laboratory and in the field (ref: University of Cologne, Hering).

7. Combination of techniques to address a comprehensive evaluation of the issues (ref; Tijerina) during CAS development. A framework for evaluating lane change crash avoidance systems was presented as an example. The framework consists of a series of questions to be considered during evaluation and indicates the possible methods that might be applied to address these questions. A comprehensive evaluation should address at least the following questions:

   Does the CAS address driving conditions related to crash involvement?
   Does the CAS logic support driver's decision making tasks?
   Is the CAS display location compatible with normal driver behaviour?
   Does the CAS match the driver's sensory characteristics?
   Is the CAS display content meaningful to the driver?
   Does the CAS have any unintended negative safety consequences?
   Does the CAS reduce crash incidence or severity?

   These questions should be expanded to address the impact on drivers of non-equipped vehicles and other road users as well as on the overall traffic patterns.

Other Information

Ford and GM have established a program of collaborative research, Crash Avoidance Metrics Partnership (CAMP), to accelerate development of ITS countermeasures by pre-competitive assessment of the need, feasibility and marketability. CAMP dropped ACC because technologies are too near to market. Current area of interest is rear-end collision countermeasures. Methodology includes development of relevant scenarios, functional requirements and test methodology. CAMP developed a rear-end surrogate target for closed-track performance tests.

NHTSA current research in three categories: projects related to specific collision types (rear-end, road departure, lane change and merge, heavy vehicle stability, intersections), driver performance (driver status monitoring, vision enhancement, human-vehicle interaction), and post-collision injury

mitigation. The Intelligent Vehicle Initiative (IVI) developed to facilitate product deployment, includes development of services (autonomous and cooperative), selection of services for integration, integrated system design and development, operational tests and evaluation.

Ian Noy, Canada	Introduction to Workshop
August Burgett, U.S.A.	The Development of Objective Test Procedures as Part of the Intelligent Vehicle Initiative
Mark Fowkes, U.K.	UK Perspective on the Need for Coordinated International Research
Gene Farber, U.S.A.	Status of the Collision Avoidance Metrics Program (CAMP)
Oliver Carsten, U.K.	New Evaluation Methods: Progress or Blind Alley?
K. Hering, Germany	Procedure for Comparative Assessment of Cognitive Load in Road Traffic
	LUNCH
Karel A. Brookhuis, Netherlands	Computerized checklist for evaluating safety of In-Vehicle Information Systems (IVIS)
Louis Tijerina, U.S.A.	An Approach to Comprehensive Evaluation of Lane Change Crash Avoidance Systems
Lena Nillson, Sweden	The Role of Simulation in Prospective Evaluation of ITS: Can Simulation Techniques Be Used to Determine If an Application is Safe or Unsafe?
Farida Saad and Thérèse Villame, France	Assessing New Driving Support Systems : Contribution of an Analysis of Drivers' Activity in Real Situations
Mr Lauchlan Macintosh	Implementation of In-vehicle ITS Applications to Improve Road Safety in Australia
	BREAK
Kaneo Hiramatsu, Japan	Overview of Japanese human factors ITS research
Jean-François Forzy, France	Ergonomic Evaluation of the Driving Support Systems: The Case of a Route Guidance System
Thérèse Villame, France	Assessment of the Influence of an ACC System on the Driving Activity: Methodological Issues for Data Collection and Analysis
James R. Sayer, P.S. Fancher, R.E. Ervin, and M.L. Mefford, U.S.A.	Adaptive Cruise Control: Results of Usability Testing From a Field Operational Test.
Florence Nathan, France	Ergonomics in Driving Support Systems Design Process : Example of Intelligent Cruise Control

FRAMEWORK FROM PAPER BY LOUIS TIJERINA

Table 1. A Template for Comprehensive Lane Change CAS Effectiveness Evaluation

Evaluation Question	Explanation	Methodologies
Does the CAS concept address driving conditions related to crash involvement?	This is an examination of the question about whether or not the CAS could be highly effective in relevant driving situations.	Analysis of the target crash type in terms of distinct kinematic or situational crash subtypes, contributing or causal factors, and their interaction.
Does the crash avoidance system logic support the driver's decision making and driving tasks?	This portion of the assessment assesses the extent to which the CAS provides the driver with information in a form and sequence adequate to let the driver determine • the current driving situation, & • acceptable actions to maintain safety (e.g., does CAS support maneuver proceed/postpone decisions, adjustments to current driving, or appropriate evasive maneuvers)?	Analytical studies of human performance limits with alternative warning rules or system performance characteristics; Simulator, test track, and on-the-road studies of studies of driver reaction to system alerts and warnings in typical driving and crash hazardous situations to assess their efficacy in promoting driver awareness in maneuver decision-making and appropriate maneuver execution.Does the CAS have any unintended negative safety consequences?
Is the CAS display location compatible with normal driver behavior?	Assessment of how the CAS location or placement accommodates or interferes with (e.g., increases driver workload, occludes view of driving scene) typical information gathering behaviors while driving.	Studies of "plain old driving" to characterize maneuver decision and execution with which the CAS must be compatible
Does the CAS match the driver's sensory characteristics?	This evaluation determines the extent to which the driver can see, hear, or feel the CAS driver display(s) in all applicable driving contexts	Checklists composed of human factors guidelines; experiments to test that CAS driver interface matches driver's sensory capabilities in typical driving situations and those that are related to the target crash problem (s).
Is the CAS display content meaningful to the driver?	This assessment probes the extent to which the display matches driver population stereotypes or expectations with regard to urgency, orientation to the hazard, and corrective action.	Checklists developed with respect to basic human factors data on driver population stereotypes; experiments to verify comprehension of CAS display content in context of driving and target crash avoidance.
Does the CAS Have Any Unintended Negative Safety Consequences?	Does the CAS modify driver behavior or performance in safety-negative ways, e.g., by increased reliance on the CAS? Does the CAS increase exposure to driving hazards? Does the CAS interact with other ITS safety technologies to modify overall safety?	Laboratory, test-track, and on-the-road studies (field studies and operational field tests) to examine changes in driver behavior and performance.
Does the CAS reduce crash incidence or severity?	Is the CAS likely to reduce the number of target crashes, or decrease the severity of crashes that do occur, or both? Is the CAS likely to increase other types of crashes, thereby leading to either no gain or a net loss in overall highway safety?	Field studies and large-scale operational tests to estimate crashes avoided or crash severity reduction; crash statistics and analysis thereof.

Informal doc. No. 5
113th WP. 29, Agenda Item 9.3.
Transmitted by the Expert from Germany on behalf of the Special Ad-hoc Group

Information and Communication Systems in Motor Vehicles: Safety and Man Machine Interface

A special Ad-hoc group of WP29 met on 14th October in Berlin. The discussion led to the following results:

1. The group confirmed the importance of the issue of safety and man machine interface.

2. There was consensus that developments should not only be observed and reacted to but should be anticipated as far as possible

3. Recommendations or Regulations should not hinder relevant innovations

4. Because of the state of current knowledge concerning assessment criteria and methods, Type Approval is not feasible at this time. Therefore the „Guideline-model" is seen as a helpful starting point.

5. The Guidelines transmitted by the German expert group, which take account of guidelines and work from other countries, are supported by this Ad-hoc group.

6. It is recommended that the Guidelines be converted into an official document for consideration and discussion by the delegates of WP29 in March 1998.[1]

7. There was general agreement that, as a minimum first step, the Guidelines be incorporated in the Consolidated Resolution RE.3.

8. It was agreed that the Guidelines should be developed further to become more precise, in order that in-vehicle systems can be properly assessed.

9. It is recommended that Contracting Parties of the 1958 Agreement encourage the Industry to use the Guidelines as part of their design and assessment processes. The Ad-hoc group recommends that developments in the market should be monitored.

10. Some countries, including Switzerland, were interested developing Regulations in this area as a next step.

11. Regulation is of special importance for traffic safety. Standardisation should be encouraged to support Regulations, which could be based on appropriate standards.

---

[1] Additional comment by Germany: After the adaption of this report and possibly hints of WP. 29 the final draft of the „Guidelines ..."(see informal doc. No. 1, AC 2 / 111th WP. 29) will be circulated immediately to the members of the Special Ad-hoc Group, asking for agreement once more again, submitted as official document for the WP. 29-session in March 1198 on time.

Informal doc. No. 5
113th WP. 29, Agenda Item 9.3.
Transmitted by the Expert from Germany on behalf of the Special Ad-hoc Group

Next Steps

Discussion should take place within WP29 in March 1998 and the Guidelines placed within RE.3 as soon as possible.

This group recognises that developments are taking place in other fora such as the EU and ESV (Enhanced Safety of Vehicles conference) and recommends that co-operation between all these initiatives be pursued.

Monitoring of the use of the Guidelines, and of the effects of in-vehicle systems on traffic safety is required. The results of monitoring may indicate the need for development of Regulations.

Japan's Safety Guideline on In-vehicle Display Systems

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ABSTRACT

Japan Automobile Manufacturers Association, Inc, (JAMA) drew up the Safety Guideline on In-vehicle Display Systems, which is targeted mainly at car navigation systems, and put it into effect in Japan in November 1990. This guideline applies to the display systems installed in vehicles at the factories of Japan's 11 vehicle manufacturers and to onboard VICS (Vehicle Information and Communication System) equipment, including after-market products. To date, approximately 500,000 vehicles fitted with such equipment have been sold in Japan.

This paper describes the background behind the formulation of this guideline and the basic concepts and details embodied in it.

INTRODUCTION

The presentation of various types of information to drivers via in-vehicle display systems can bring about a variety of benefits. On the negative side, there is also the possibility that the driver may pay less attention to driving operations. For this reason, it is thought that restrictions should be placed on the content of the information displayed and on the methods of operating.

BASIC CONCEPTS EMBODIED IN THE GUIDELINE

Drivers usually look at and operate display systems when the driving workload is light, i.e., when driving operations allow the latitude for such tasks. When the driving workload is relatively heavy, drivers tend to separate the tasks of recognizing displayed information and operating display equipment. This behavior is thought to result from a human self-defense mechanism against potential danger.

The capabilities of display systems for presenting traffic congestion and navigation information can be useful in promoting traffic safety, smooth traffic flows and environmental preservation, among other benefits. Therefore, it was thought that the presentation of information by display systems and the operation of such equipment should be prescribed in line with the following concepts in order to take full advantage of those useful functions without impeding the self-defense mechanism.

- Information unrelated to vehicle operation and that which would trigger a recognition attempt by the driver should not be presented.
- The presentation or manipulation of information requiring continued close observation of the screen should be prohibited.
- Display and operation methods should be devised so that an optimal amount of information is displayed on the screen and so that the tasks of recognition and manipulation can be performed separately.
- Functions that detract from the public interest should not be provided.

The guideline was embodied this concepts and prepared on the basis of results inferred from various types of test data.

OVERVIEW OF THE GUIDELINE

PRESENTATION OF INFORMATION BY DISPLAY SYSTEM

While a vehicle is being operated, the images shown on the display system screen must be quickly comprehensible by the driver and satisfy the conditions noted below.

Map Displays; Navigation maps should not show small streets in urban areas. This does not apply, however, to small urban streets that are important to the road network or to route determination and selection. When map displays are scrolled according to the driving speed of the vehicle, the map scale should not change to the extent that the driver would become confused.

Information on Restaurants, Hotels, etc.; Information on restaurants, hotels and the like must not be displayed during vehicle operation. However, intermediate images used to search for a restaurant, hotel or some other place may be displayed while a vehicle is being operated provided that they do not contain such information.

Display of Dynamic Information; In the case of superimposing dynamic information concerning traffic congestion or other conditions on a map display, the total amount of information shown on the screen must be optimized. The dynamic information refers to information that is transmitted from outside of the vehicle and that

its content constantly changes with the passage of time .

Advisory information must be presented so that it is easily discernible from other information.

Travel time must be quickly comprehensible by the driver, and must not require the driver to perform any complex calculation to determine the travel time.

The following conditions must be met for text displays of dynamic information, provided that the names of the information providers (e.g., broadcasting stations), titles, information provision time and the like are not considered as dynamic information.

- Text displays must not be scrolled.
- More than 30 characters (Japanese kanji, kana) must not be displayed on the same screen.

DISPLAY SYSTEM OPERATION

The control switches of display systems must be easy for the driver to operate, and the following complex switch operations are prohibited unless they are improved and changed to simple tasks.

- Setting or changing one's destination by cursor switch operations
- Map scrolling
- Selection of different map areas
- Manipulation of cellular phone keys
- Entry of addresses, memos and other information
- Searches for addresses, phone numbers, restaurants, hotels and the like
- Selection of areas indicated by dynamic information
- Scrolling of dynamic information

BASIS OF THE RESTRICTIONS IN THE GUIDELINE

In this section, we introduce the basis of the restrictions in the guideline.

The allowable glance duration and number of glances that would not affect safe vehicle operation was investigated in order to determine the restrictions. Glance duration begins from the moment the driver starts to take his eyes off the road ahead and continues until the person returns his gaze to the road again after viewing the object in question. In cases where drivers need to read complecated infomation, they may read the information in N number of glances, because they figure that they cannot grasp all the details in one glance at the screen while driving. The total time of glance durations T can be calculated as

$$T = D \times N$$

where D is the average duration per look and N is the number of glances.

EXPERIMENT 1: RELATION BETWEEEN DURATION TIME AND LATERAL DEVIATION DURING STRAIGHT-LINE TRAVEL

When a driver's attention to the road ahead is reduced as a result of looking away, the vehicle is apt to meander from a straight-line path. It is thought that the amount of lateral deviation increases in proportion to the reduction in the driver's attention. An experiment was conducted to examine the relationship between total duration time and vehicle lateral deviation during straight-line travel when the driver glanced at or operated typical in-vehicle equipment.

METHOD

The subjects were instructed to drive at a speed of 100 km/h while maintaining as much as possible a straight-line course along the center line on the road. They were asked to perform traditional tasks such as checking the instrument readings and operating the climate or radio controls. They were also asked to perform other tasks such as entering phone numbers, setting their intended destination on a map display.

A video camera mounted on one side of the vehicle recorded the center line in order to measure the vehicle behavior. Another camera was also installed inside the vehicle to record the driver's face during the experiment. After the test, the vehicle behavior was analyzed to measure how much lateral deviation occurred when the driver performed the operational or confirmation tasks. The direction of the driver's gaze was also analyzed to measure the total duration time. This experiment was conducted on the straight way segment of a high-speed test course.

RESULTS

Figure 1 shows the average duration time and the number of glances for each task. The average duration time was two seconds or less and the number of glances for conventional tasks was three or less.

A correlation was observed between the total time of durations T and lateral deviation from the center line X (mm), which can be expressed as

$$X = 35T + 94 \text{ (correlation coefficient } r = 0.75)$$

The maximum lateral deviation that occurred when the drivers were told to relax while driving, and no instruction was given about following the center line, was around 400mm.

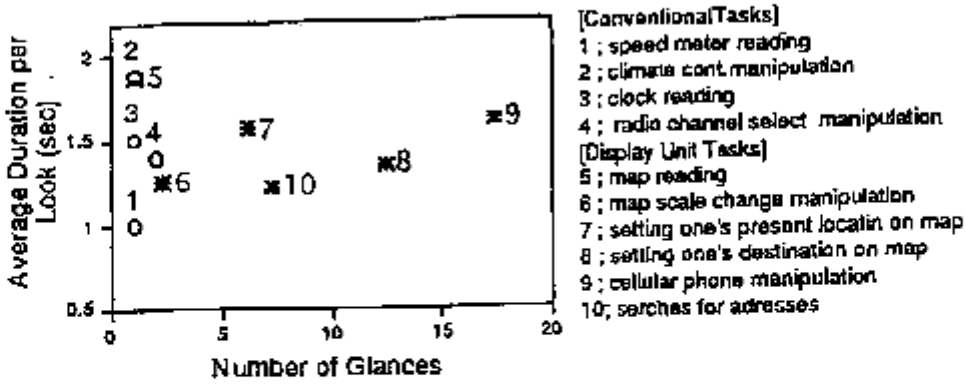

Figure1. Average Duration per Look and Number of Glances performing conventional and display unit tasks while driving

EXPERIMENT 2: DURATION TIME AND SUBJECTIVE EVALUATION

Subjective evaluations were conducted in which the subjects glanced at an in-vehicle display unit while driving.

METHOD

The subjects were asked to read silently text messages shown on a 6-inch liquid crystal display screen while they were driving. Sixty types of messages in Japanese, consisting of a mixture of kanji and kana and ranging in length from 9 to 42 characters, were shown on the screen at random. The 35 subjects were asked to evaluate their feeling of stress each time on a five-point scale. Tests designed to simulate expressway driving were conducted on the high-speed test course at a speed of 100 km/h. A second set of tests were conducted within the proving ground on a course that simulated city driving, including the presence of intersections with traffic lights.

RESULTS

Figure 2 shows the relationship between the total time of durations needed to read the text messages and the subjects' feelings of stress about driving. The evaluation scores are somewhat lower for the simulated city driving course than for the high-speed test course. The results indicate that the subjects were able to drive without feeling any stress (a score of 3 or higher) when the total time of duration was less than about 5-6 seconds.

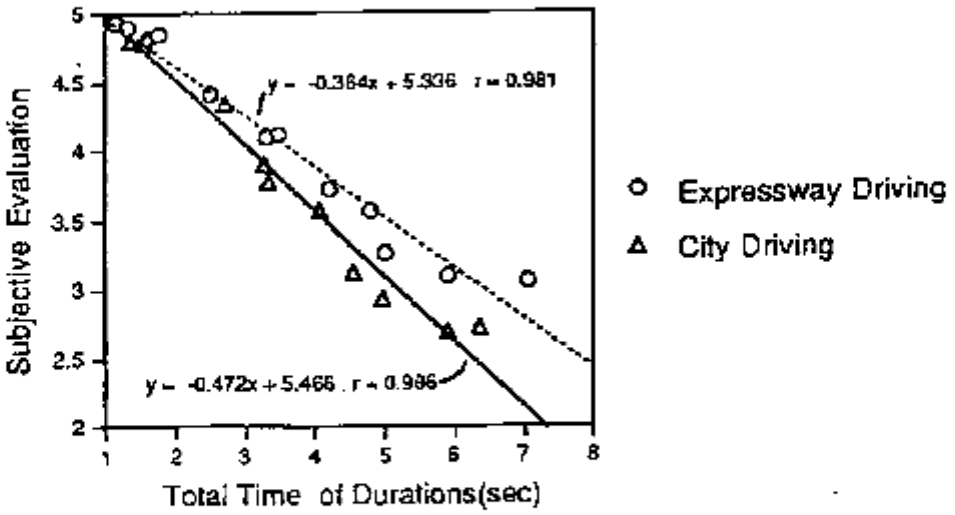

Figure 2. Relationship between Total Time of Durations and Subjective Evaluation while driving

The amount of information displayed on the screen is thought to be proportional to the number of characters. Figure 3 shows that there was a correlation between the number of characters displayed and the total time of durations.

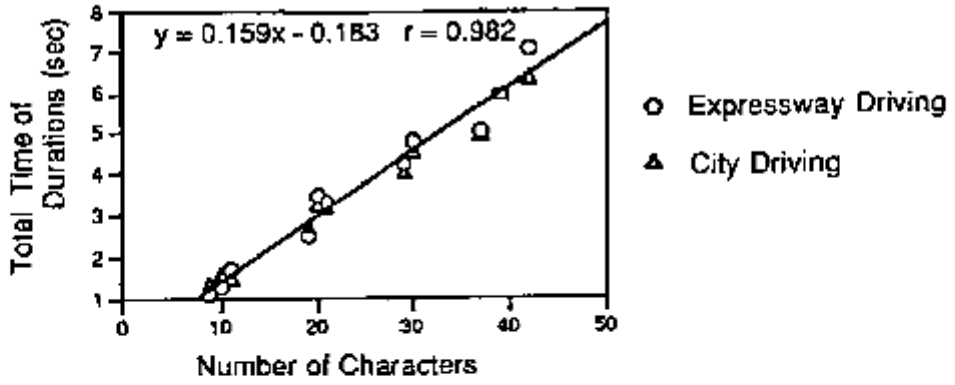

Figure 3. Relationship between Total Time of Durationsand Number of Characters while driving

EXPERIMENT 3: MAP DISPLAYS AND DURATION TIME

An experiment was also conducted to measure the total time of durations required to read other screen displays besides text messages.

METHOD

Using an experimental setup, the sixty types of text messages used in experiment 2 and map displays were shown at random on the LCD screen used in experiment 2. As in experiment 2, the subjects were asked to read the text displays silently and to push a button as soon as they had finished. In the case of the map displays, four types of problems were prepared in advance to simulate typical map-reading tasks. A problem was presented to a subject before a map display was shown; then the map was presented and the subject was supposed to push the button as soon as the person felt that he had the answer to the problem. Pushing the button caused the screen display to disappear. The subjects were the same 35 individuals who took part in experiment 2.

RESULTS

It was found there was a correlation between the total time of durations needed to read the text messages while driving in experiment 2 and the time needed to read the same text messages in this experiment using an experimental setup. So, it is possible to estimate the time to read map displays while driving.

The reading times obtained from the experimental results indicate that the map reading times were significantly shorter than the reading times for the 20-character text messages.

DISCUSSION

The results of experiment 1 indicated that the maximum lateral deviation (400mm) during a condition of relaxed driving corresponded to a total durations time of around 7-8 seconds. Because lateral deviation can vary greatly depending on the characteristics of the vehicle, individual differences among drivers, and road surface and weather conditions, it is not possible to formulate an absolute index. Yet there is significance in making comparisons under a condition where the same person operates the same vehicle. This study indicates that the total time of durations should be less than a maximum of 7 seconds.

The results of the subjective evaluations also showed that when the average duration exceeded around 5-6 seconds, the evaluation scores dropped below 3 and feelings of stress appeared. And conventional tasks such as checking the instrument readings or operating the climate and radio controls have traditionally been performed within a total duration time of less than 5 seconds.

For these reasons, the total duration time for operating in-vehicle display systems or reading the displayed information should also be less than 5 seconds as a target value.

This conclusion is match for that of Zwahlen et al. (1),(2). They proposed if the average duration time was 1.4 sec, number of glances should not exceed 4. (In this case total time of durations is calculated as 5.6 sec.)

The results of experiment 2 indicated that text messages must not contain more than 30 characters (a mixture of kanji and kana) in order to achieve the target value. While the reading time for map displays can vary greatly depending on the situation, the total duration time for typical map reading tasks that might be expected in real-world driving was less than 5 seconds, indicating that there should not be any problem. On the other hand, certain tasks were found to exceed target value and it is thought that they should be prohibited while driving. These include tasks that involve an exceptionally large number of operations, such as the entry of phone numbers from a ten-key pad. Other examples are tasks that involve fine adjustments and prolonged scrutiny of the screen, such as in the case of correcting one's present location on a map or setting an intended destination by means of cursor operations.

The restrictions in the guideline were determined by these results.

CONCLUSION

Seven years have now passed since the guideline was put into effect. During this time, there have not been any reports of any major accidents caused by the in-vehicle display systems covered under this guideline, although this is still being researched at present. It is concluded therefore that the guideline has played a certain role in contributing to the diffusion of in-vehicle display systems and car navigation systems in Japan.

ACKNOWLEDGEMENT

The research reported in this paper was conducted by JAMA. The Authors thank Shigeru Hirayama (Hino Motors, Ltd.), Tetsuya Ishida (Nissan Diesel Motor Co., Ltd.), Haruyoshi Ito (Toyota Motor Corp.,), Masaki Kakihara (Mazda Motor Corp.,), Hiroyuki Kamiya (Honda Motor Co., Ltd.), Masaaki Kanou (Isuzu Motors Ltd.,), Hirotsugu Kondo (Mitsubishi Motors Corporation), Masato Minode (Daihatsu Kogyo Co., Ltd.), Yukiji Nakano (Fuji Heavy Industries Ltd.,), Hiroshi Nanba (Toyota Motor Corp.,), Kenji Suzuki (Suzuki Motor Co., Ltd.).

REFERENCES

(1) Zwahlen, H.T., Adams Jnr., C.C., et al., Safety Aspect of CRT Touch Panel Controls in Automobiles. Vision in vehicles II, pp.335-344, 1988

(2) Zwahlen, H.T., Adams Jnr., C.C., et al., Safety Aspect of Cellular Telephones in Automobiles, Int. Sympo. on Automot. Techno.& Automation, No.88058, 1988j

The Role of IHRA-ITS WG: Safety Test and Evaluation

Discussion Document

At the October 1997 meeting in Berlin the group had difficulty focusing on the workplan, partly due to the complexity of the challenge facing the WG and partly due to different points of view and expertise represented within the group. In order to attempt to sharpen the group's focus, I have taken the liberty of enumerating some fundamental principles which need to be either accepted or amended.

1. The WG is concerned with summative evaluations (rather than formative evaluations), that is final evaluations which apply to products that have been developed to the point of being ready for implementation in the real world. In the normal course of development, products undergo design iterations that involve the acquisition and analysis of relevant human and other data. Formative evaluations that are conducted in the course of product development are beyond the scope of the WG. However, it is recognized that such activities are important and contribute to overall system safety. While they are normally conducted by industry, governments often assist in the analysis of collision data and the formulation of operational requirements or design guidelines when the systems being developed fall within the realm of collision countermeasures. It is important to understand that the mandate of this WG does not include formative evaluations. Instead, the goal is "to develop procedures (including methods and criteria) for the evaluation of safety of in-vehicle information, control and communication systems with respect to human performance and behaviour" and is intended to address cross-cutting issues rather than to focus on specific applications.

2. It is recognized that industry's role is to develop products that are effective, safe and acceptable to the public. Government's role is to ensure that products comply with appropriate safety criteria. The development of such criteria is the business of this WG. It should be noted that while there are numerous groups developing standards and operational requirements, no other body is addressing summative evaluation criteria.

3. The WG is concerned with collision avoidance systems as well as systems that are intended to enhance driver convenience.

4. Summative evaluations can be either content oriented or process oriented. Content oriented evaluations implement prescribed test protocols and compare measured values against a pre-established criteria. Process oriented evaluations review product design and development processes to ensure that relevant safety issues were considered, that appropriate standards have been consulted, that appropriate formative evaluations have been performed and that results have been adequately reflected in the final design.

5. Regardless of the type of standard that will eventually emerge (content or process), the standards will require the development of a framework for evaluation. This framework will enumerate a set of safety issues that are to be assessed and identify, for each issue, possible techniques that can be used to address the issue. As it is unlikely that absolute system performance criteria can be specified, the techniques will take the form of comparative evaluations. Hence, to be useful for safety assurance, benchmarks will need to be established. The techniques will also need to specify safety indicators, or measures believed to be relevant to safety. A major item for the WG, therefore, is to develop the specific elements of the framework.

6. The WG should also monitor formative evaluations and activities/programs that aim to develop operational requirements for collision avoidance systems as well as human-machine interface standards. While the WG will not develop minimum requirements for collision avoidance systems or MMI standards, it may refer to them once their effectiveness will have been established.

7. The overall role of the WG with respect to ITS safety T&E is depicted in Figure 1.

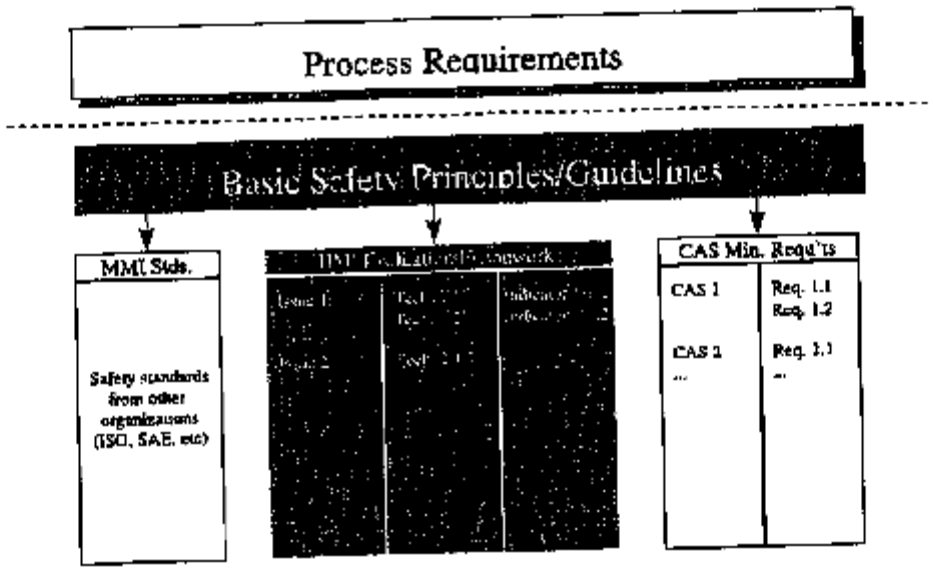

Figure 1: ITS Safety Test & Evaluation Requirements

The essential work of this WG is indicated by the shaded boxes. There are two main elements: basic safety principles/guidelines, and HMI evaluation framework. The basic safety principles/guidelines provide operational and design information that would ensure that products are compatible with

general driver characteristics. For example they would ensure that ITS products that are available while driving do not overload the driver or intrude on the driving task. Several such guidelines now exist. They will need to be assembled, compared evaluated and consolidated.

The second role of the WG is to develop an HMI evaluation framework (see item 5, above). The specific elements of the framework will have to be elaborated before further consideration can be given to how such a framework can be implemented.

The boxes to the left (MMI standards) and right (CAS minimum requirements) of the framework represent work underway elsewhere (e.g., within industry, other governments, and standards organizations). They are shown to give an overall perspective of a comprehensive safety assurance program which should incorporate relevant information from all of the boxes. ITS safety assurance requires reference to all of the elements. For example, all ITS products will have to comply with the basic principles and relevant MMI standards. In addition they will have to undergo test and evaluation as indicated by the HMI evaluation framework. If they are CAS, they will have to meet additional applicable minimum performance requirements.

The dashed line separates procedures and criteria developed within the a context of collaborative R&D from regulatory requirements. A process-oriented regulation (as described above) is shown as referring to all of the elements in the diagram. This is not necessarily the way safety will ultimately be regulated, and other possibilities can be substituted in this box.

IHRA - ITS WG
ITS Safety Test & Evaluation
International Survey of Relevant Research

The purpose of this survey is to collect information to be included in a database of research relevant to Intelligent Transportation Systems (ITS) safety test and evaluation. In particular we are interested in all work on-going or completed in the last five years that may be relevant to the development of procedures that can be used to assess the safety of on-board information, control and communication systems with respect to human performance and behaviour. The techniques may include measures of performance, workload assessment, usability, situational awareness, protocol analysis, human reliability analysis, etc.

Under the auspices of Enhanced Safety Vehicle (ESV), the International Harmonized Research Activities (IHRA) program was established to facilitate collaborative research in priority areas. It is hoped that this joint research will lead to a shared understanding of the issues and provide a sound scientific basis for harmonized policies. The Working Group on ITS was formed in recognition that automotive systems and related technologies are evolving very rapidly and their potential to influence motor vehicle safety is considerable.

Within the domain of ITS, governments have a dual responsibility; a) to encourage the development of technologies that can enhance safety, and b) to discourage technologies that have the potential to adversely affect safety. The International Harmonized Research Activities Working Group on Intelligent Transport Systems (IHRA-ITS WG), the group responsible for this survey, has focused on the need to develop systematic procedures and criteria for testing the safety of in-vehicle ITS systems as a strategy of intervention.

We request your cooperation in completing this survey. A separate form should be used for each particular study or project. We thank you in advance for your efforts would be grateful to receive the completed survey by February 1998.

PLEASE COMPLETE & RETURN BY 01 FEBRUARY 1998 TO:

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Chief, Ergonomics Division
Transport Canada
330 Sparks St.
Ottawa, Ontario, Canada K1A 0N5
Tel: (613) 998-2268, Fax: (613) 998-4831
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IHRA - ITS WG
ITS Safety Test & Evaluation
International Survey of Relevant Research

1 IDENTIFICATION

1.1 Title of project :

1.2 Performing Organization :

■ Sponsor :

■ Sponsor's Country :

■ Primary Researcher :

■ Location(s) where study was performed (i.e. city(s), experimental center(s)) :

1.3 Date of completion (or expected date of completion) :

1.4 Is this part of a larger program :

☐ NO

☐ YES

If YES please specify :
(attach additional paper if necessary)

1.5 Describe the system studied :

☐ Navigation/route guidance
☐ Traffic and traveler information
☐ Cellular telephone or other communication
☐ Adaptive cruise control
☐ Forward collision warning
☐ Vision enhancement
☐ Driver condition warning
☐ Rear-end collision avoidance
☐ Road departure collision avoidance
☐ Lane change and merge collision avoidance
☐ Intersection collision avoidance
☐ Vehicle stability warning & assistance
☐ Vehicle diagnostics
☐ Obstacle/pedestrian detection
☐ Low friction warning & control assistance
☐ Other (please describe)

2 STUDY OBJECTIVES

2.1 Describe the main purpose of the study :
(tick ALL applicable responses)

☐ product development of an ITS
☐ demonstration of an ITS
☐ safety analysis of an ITS
☐ marketing of an ITS
☐ other (please explain)

IHRA - ITS WG
ITS Safety Test & Evaluation
International Survey of Relevant Research

3 DATA & INFORMATION COLLECTED

3.1 Did the study collect data about the following that could be applicable for other ITS applications/studies?
(tick ALL applicable responses)

- ☐ system features
- ☐ system usability
- ☐ methodologies for evaluation
- ☐ safety requirements
- ☐ system performance
- ☐ other (please describe)

_____

_____

3.2 Does the study advance the current understanding or methodologies in safety tests?

- ☐ YES
- ☐ NO
- ☐ No opinion or N/A

3.3 Does the study offer data that can be used to establish safety benchmarks?

- ☐ YES
- ☐ NO
- ☐ No opinion or N/A

3.4 Does the study address interoperability issues (can the system be used in different countries, different vehicles, different drivers etc.?)

- ☐ YES
- ☐ NO
- ☐ No opinion or N/A

4 TEST METHODS

4.1 Describe the techniques used to elicit information :
(tick ALL applicable responses)

- ☐ experimental (tick ALL applicable types of experimental techniques used)
  - ☐ laboratory
  - ☐ simulator
  - ☐ closed track
  - ☐ open road / in traffic
  - ☐ mixed (please specify)

_____

- ☐ observation
- ☐ modeling
- ☐ focus group
- ☐ other (please describe)

_____

_____

4.2 Did the study involve driving?

- ☐ YES
- ☐ NO

If YES, then what was the setting?

- ☐ urban
- ☐ rural
- ☐ mixed
- ☐ other (please describe)

IHRA - ITS WG
ITS Safety Test & Evaluation
International Survey of Relevant Research

4.3 Measures (e.g., experimental or observational)

- ☐ subjective (list _____)
- ☐ objective (list _____)
- ☐ other (please specify) _____

4.4 Indicate the selection criteria for study participants:

_____

4.5 Indicate the number of participants used:

_____

4.6 Driver input method:

- ☐ voice
- ☐ manual
- ☐ other (please specify) _____

4.7 System feedback:
(tick ALL applicable responses)

- ☐ visual
- ☐ auditory
- ☐ tactile
- ☐ other (please specify) _____

5 APPLICATION OF THIS ITS SURVEY

5.1 APPLICATION

- ☐ automotive
- ☐ other (please specify) _____

5.2 Relevance to safety test and evaluation:

- ☐ low
- ☐ medium
- ☐ high

6 ADDITIONAL INFORMATION

6.1 Please attach a list of literature cited, an executive summary, if available, and a reference of the project, if published.

§

PLEASE COMPLETE & RETURN BY
01 FEBRUAR 1998
TO:

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Transport Canada
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Ottawa, Ontario, Canada
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Tel: (613) 998-2268, Fax: (613) 998-4831
NOYI@tc.gc.ca

Thank you for completing this ITS survey
Information from this survey will become available at the Enhanced Safety of Vehicles Conference
June 1998
www.tc.gc.ca/esv98.htm

PROGRESS REPORT / IHRA/PEDESTRIAN SAFETY

October 15, 1997
JMOT

On May 8, 1997, the IHRA Steering Committee was held in the Washington DC, U.S.A. This report summarizes the activities related to the subject above which had been conducted since May 8 when the Progress Report was submitted (on May 8) at the aforesaid IHRA Steering Committee.

The First Meeting of Experts on Pedestrian Safety
Place: Meeting Room of Ministry of Transport, others (Tokyo, Japan)
Date: July 15 through 16, 1997
Attendance: Experts from Australia, EU (EEVC), Japan and the U.S. (Refer to the attached list.)

Contents of Main Deliberations

- Japan introduced each expert the Plan which had been proposed to the IHRA Steering Committee and the draft which had been incorporated into the Implementing Procedure based on the Plan in order that the information concerned may be possessed in common through deliberations.
- Furthermore, Japan introduced the accident analysis data in the past along with the Plan and the draft Implementing Produce. Based on these, deliberations were made in order that the idea of each expert and expectation may be understood by all. At the same time, the following agreement has been reached.

The following are the contents of the agreement that has been reached basically through deliberations.

1. Because of the U.S. explanation that the dummy development (committed to the U.S. Biomechanics Project) is impossible if the completion of the test method were to be targeted by the year 2001, the development is started based on the component tests that has been adopted by ISO and EEVC.
2. It has become clear that we can not get the offering of the latest accident analysis data from each country at the earliest until after the next spring. Therefore, it has been decided to start the study of the head test method (adults and children), that pertains parts which are regarded as those most likely to receive most serious injuries, and the study of the leg test method (adults), that pertains parts which are anticipated as those most likely to receive injuries most frequently.
3. It is true that infrastructure and education are very effective to reduce accidents. However, we at the project experts are not

necessarily experts for these fields. Therefore, we have agreed that we will study these fields to such an extent that we will review only those which are available to us and will touch them in a part of the report.

4. The applicable motor vehicles are passenger vehicles. However, some members have such a view that the passenger vehicles include even large-sized buses. Therefore, we have construed that the applicable motor vehicles belong to the ECE category M1. Thus, this subject will be finalized at the next time when we bring in our respective views.
5. In order to verify technical compatibility of various proposed test methods and to prevent from unbalance between those test methods and other regulations, we have agreed that this study be incorporated in the schedule. The automobile industry has agreed that it will launch the check of this field.
6. We have already requested each country concerned to submit the latest accident data. Nevertheless, the chairman urged each expert again to submit these requested data.
7. The experts have agreed that the meeting of experts be held about twice a year and that each country concerned to take a turn to become a host country. It has been asked that the next meeting will be held in the U.S. around a time before or after the SAE Congress.

Requests to IHRA Steering Committee

1. Definition of Passenger Vehicles
We would to like to get recommendation concerning the definition of this term, if it is necessary to unify it with works of the other projects.

Attached Data

1. The minutes of the First IHRA Pedestrian Safety Expert Meeting
2. Attendee List
3. List of Documents

Meeting can be held in any country provided WG members can attend

Meeting Minutes

for the 1st expert meeting of IHRA pedestrian protection
15-16 July 1997, Tokyo

Day 1 (Tuesday 15 July) Japan Light Motor Vehicle Inspection Organization, Tokyo, Japan

1. Opening of the meeting
The meeting Convener, Mr. Mizuno opened the meeting at 9:30 and Mr. Matsumoto with MOT welcomed delegates by stating the objectives and a need for this harmonized activity for the time frame of 5 years starting with ESV Conference 1996 in Melbourne aiming at the harmonized regulation for the next century.

- Confirmation and numbering of the documents
  (See attached sheet Appendix 1)

Mr. Sasaki briefly confirmed all documents and JASIC secretariat numbered them.

Roll call of delegates
(See attached sheet Appendix 2)

4. Adoption of meeting agenda
The body approved the agenda, Doc. IHRA/PS/15, without change.

5. Appointment of the editing committee
Mr. Saul was appointed the editing member.

6. Explanation of the progress from the first IHRA committee meeting
The Convener reviewed the progress of IHRA after ESV Conference 1996.
The Convener indicated that we need to propose a reasonable harmonized test procedure to ESV Conference 2001.

Introduction and discussion of the draft plan
Mr. Sasaki briefly explained draft plan. (Doc. IHRA/PS/3)
The Convener asked if there is any question or comment concerning draft plan which had been delivered in advance.

Mr. Lawrence requested to see the draft plan page for page. He questioned if the task for the test procedure is already decided under the "Purpose" . He further raised the point that we have no definition of "Passenger vehicle". A coach and bus could be a passenger vehicle.
The Convener proposed to discuss the definition of "passenger vehicle" later.

Mr. Saul wished to clarify the "Purpose" prescribed in the draft plan, and asked if this purpose had been decided by ESV Conference 1996, and what direction of test procedure might be up to working group.

The Convener spoke of the main task of this working group which is to propose the appropriate test procedure, referencing the two test procedures, EEVC's and ISO's.

Mr. Bartolo questioned if there is to be discussion at ESV to recommend a criteria or injury requirement.
The Convener interpreted the working group position is that the criteria or requirement doesn't see a

need for our task. The issue should be addressed by regulatory agencies in individual countries.

Mr. Lawrence, however, indicated that if this test procedure is to be used in regulation, it should include a requirement.
Mr. Saul felt that the criteria or requirement might be secondary issue, at least we need to have the unified test procedure among the different countries that they can possibly set different tolerance level.

Mr. Lawrence pointed out that we propose some guidance, if we use HIC1000 as a target to prevent fatal wound which has been prevailingly accepted. We need to specify more accepted criteria for some guidance so that political decision can be made.

Mr. Lawrence requested clarification on terminology of *"technical standard"* quoted in the page 2-2, stating *technical standard* seems to be different from regulation, and makes him in confusion, while the body assumes this term *"technical standard"* and regulation are all but same meaning.
The Convener indicated that *"technical standard"* meant the technical regulation in this context.
The Convener asked, in this connection, English native speakers out of delegates to correct inappropriate words used in the paper, since it's not easy to use foreign language properly.
Mr. Saul indicated that we are approaching the research aspect, and developing and the underlying information of research and testing procedures that various countries might use, and the second step, could be to develop their technical procedures or technical standards in the various countries focusing on research and agreement on how each country does it for the technical standards.

Mr. McLean raised a question regarding the last sentence of "EC/EEVC/WG10" on page 2, and indicated that working group should concentrate on vehicle factors and the interaction between pedestrian and passenger car, and like to suggest the group might consider and propose IHRA a view that this would be outside of scope of this committee, regardless of development of traffic safety facilities or education on pedestrian / driver.

The Convener, however, interpreted that although this working group should deal with vehicle side, we need to be aware of scope of responsibility taken by vehicle itself.
Mr. Jachn indicated that we want to develop the test procedure, and we have to assess the benefit of such test procedure, at least we should know that the test procedure will be happen if we use this.
Mr. Yamaoka basically accepted to concentrate on the vehicle side, but raised one point that we need to be in common recognition that the issue on pedestrian safety may not be easily resolved by merely addressing vehicle responsibility. Also, suggesting that we need to set it forth as a premise that the scope of the responsibility for what vehicle should take need to be addressed in advance for pedestrian safety substantially.
Mr. Lawrence also acknowledged the need for our encouragement of improvement of infrastructure and that will lead to reduce the fatalities in fact. The task of this working group is to look at the vehicle separating the issue from the other.

Mr. Saul indicated that each country has own expertise for infrastructure and education that might be more benefit and more important in one country than another.
He felt that US probably is important too, they somehow address cost-benefit in the future combined with infrastructure / education. It will be possibly general way to address the combined factors that results in benefit in US.

Mr. McLean introduced their in-depth study with since mid 1980's for head injuries research in Australia. They have conducted detailed investigation of 200 fatal pedestrian accidents that they made a guesswork and estimated that speed reduction by 5-10km/h to 50km/h from 60km/h in the urban area, might be effective in 1/3 reduction pedestrian fatalities cases. He consequently pointed out that

a significant majority of fatal pedestrian crashes involve the pedestrian striking the front of the vehicle, and that design changes to the front of the vehicle which reduced the severity of impact between the pedestrian will reduce the number of fatalities in Australia.
Mr. McLean recommended that the working group reports to parent committee IHRA that speed changes conceivably could be desirable, but as a piece of evidence the working group has nothing more to do.

Presentations from experts on this project
Mr. Lawrence raised a question why the draft plan included the infrastructure / education, this working group should be directed more at test procedure.
Mr. McLean also supported Mr. Lawrence's opinion.
In answer to this question, the Convener replied that the matter of infrastructure is to be dealt "slightly" as a general topic to define the responsibility owned by vehicle from the perspective of pedestrian safety, stating further that the main objective is to study the test procedure though.

Mr. Sasaki understood the difficulty to contain the infrastructure in the plan, since the situation at every country is different, and proposed the infrastructure to be got rid of the plan.

Mr. Saul felt that the issue on who and which country should take responsibilities is serious, and it must be important for policy makers, but cost-benefit and infrastructure is going to be different each country. Mr. Saul proposed making infrastructure stay there but with less burden due to no expertise available. He felt it would be interesting to make sure the effectiveness from NHTSA perspective, having faced their problem in place that deals not only with crash injury but also with educational infrastructure, how they are going to handle on the federal highway.

The Convener proposed, having supported Mr. Saul's opinion, that the matter of infrastructure is to be dealt "slightly" in "introduction" or the like to remind government or concerned people the importance from the perspective of pedestrian safety, stating further that the main objective for this working group is to study the test procedure.

The body agreed with the Convener's proposal, but Mr. McLean questioned further if the working group is going to do some work here on the road infrastructure for pedestrian safety or rather merely acknowledge the importance.
Mr. McLean spoke of his intention not to contribute to some work on infrastructure, but acknowledge the importance of test procedures by reviewing the study.

The Convener confirmed that the proposed study on infrastructure should be deleted from the work plan, but acknowledge the importance of infrastructure in "introduction" or make a report to parent committee from the perspective of pedestrian safety.
The Convener Also asked Mr. Lawrence to make a proposal to draft his plan touching on infrastructure so as to be circulated at the next meeting.
Mr. Lawrence agreed with the Convener's request.

Mr. Jaehn raised a question, in connection with re-drafting, if it's available to revise the original once authorized by steering committee IHRA.
The Convener predicted it could be available.

Mr. Saul requested to clarify the meaning of next meeting whether re-writing on article 5-4 should be for tomorrow meeting or for the meeting of 6 months ahead.
The Convener replied inappropriately, seems like misunderstanding, stating after receiving the revised draft from Mr. Lawrence, they are going to circulate for your comments.

Mr. Lawrence questioned if the Convener is requesting the correction of whole plan or section 5-4.
The Convener asked him to re-draft the infrastructure related parts out of the plan.
Mr. McLean proposed to re-write any modification by tomorrow meeting, to maximize efficiency.

— **Present situation of research on Pedestrian safety in each country**

Mr. Lawrence reported the history and status of EEVC test procedures.

EEVC working group 10 started in 1989, carried out research program sponsored by EU until 1990. They did Mathematical model, impactor development, development of test procedure etc.

In 1991, working group actually developed the 1st test method as the Directives producing the 1st prototype leg form bumper impactors with artificial knee joint and child / adult headform bonnet impactors.

In 1992, they produced Draft Directives which modified the exterior projections.

They found that cost studies done by Industries showed negative benefit.

From 1992 thru 1994, working group continued the improvement to evaluate the test method and impactors, including evaluation of current vehicles.

From 1993 thru 1994, TNO produced cost benefit studies which showed small benefit.

In 1994, EEVC working group produced the final report.

To date, TRL, TNO and BAST were working to improve the test tools. In 1995, Total text were improved and sent to EU.

In 1996, Draft Directives were drawn up for EU.

Mr. Lawrence reported that at the 1st meeting to discuss Draft Directives with EU there was big conflict between "Cost Benefit Research Institute" and Industries, the former find it to be positive benefit, while the latter small benefit. Commission accordingly decided to entrust UK MIRA with look at all the cost benefit studies assessment. Mr. Lawrence believes Draft Report from MIRA was already submitted to Commission.

Now that they have test procedure developed, and the test tools were available already, Mr. Lawrence felt that one of important jobs for working group will be to look at the different requirements from Europe and worldwide requirements. And also see whether any speed changes, additions so on like requirement of big vehicles in US, and Mr. Lawrence indicated that there was no test procedure and tools for child chest yet.

Ms. Brun-Cassan raised some questions, indicating the accident logical data used in study by Working Group 10 was rather old, and shape of the cars has been changed. From recent accident studies we can't result in not being realistic in France.

Ms. Brun-Cassan also indicated that the studies by Institute does not estimate the re-design cost of vehicles, although cost benefit studies made by both Industries and Research Institute were much different each other, according to Mr. Lawrence's report.

Mr. Lawrence replied to her question on the car shape that car shape has little changed worldwide, according to their int'l study.

Mr. Bartolo reported the current status of AAMA as follows;

They currently do not have task force committed to pedestrian safety for the concerned international safety.

AAMA is interested in the discussions and developments involving pedestrian safety, especially as it relates to vehicle design parameters, accident analysis and the regulatory environment. Pedestrian safety, including the reduction if accidents and the likelihood of injury is a major challenge for all automobile manufacturers and regulators.

Mr. Saul gave a presentation on recent research concerning pedestrian safety in US

US has not done much research with reference to Head impact since 1991

Pedestrian accident fatalities & injuries are declining since 1979, it was likely to a certain extent attribution of education.

Pedestrian Crash Data Study (PCDS) started in 1995 with a view to analyze injury causes, severity trends.

Trying look at what kind of WAD exists today to determine head impact location in comparison with '70s vehicle, and also with ISO standards.

Last year they have developed leg impactor, and they initiated this not being flexible plant type of impactor. Although it's desirable to be able develop impactor that is in compliance with ISO requirements. They are measuring bending angle moment, knee measuring shear strength, lower leg contact force of the impactor-wise.

Basically the approach they've taken is to build in moment requirements of ISO standards, friction faces can control moment response and the initial result was close to ISO requirements with moment response. They built rubber shear element, and not successful for the 1st prototype.

As for future effort they look at shear measurements and instrumentation to improve them that calibrate them to meet ISO standards with vehicle testing targeted for the end of this year

In his closing remarks, Mr. Saul suggested that it's important to demonstrate benefit in some stage, though he has no specific idea how to promote pedestrian safety project.

Mr. Saul interpreted the American Government position on pedestrian full scale dummy which same foreign country seems to have addressed to develop as follows:

We had indicated our response that it would not be until agreement, share & responsibilities are to be taken by the countries world wide, looking at proposal for pedestrian dummy, brainstorming the issue that we certainly have it put in.

Mr. Jachn questioned if Mr. Saul is trying to develop a pedestrian friendly vehicle near to serious products, in regard to "demonstration of benefit to promote the project" suggested by Mr. Saul.

Mr. Saul guessed he doesn't know what is going on this matter, but repeated what he spoke of vehicle testing based on ISO requirements.

Mr. Jachn questioned him further how to measures the benefit, i.e. if there is benefit by applying to requirements, or benefit by something else.

Mr. Saul felt that organized accident information really tell us, although he doesn't have any concrete idea.

Mr. McLean reported pedestrian fatalities in Australia, referencing Doc. IHRA/PS/16 as follows;

The number of people killed has dramatically decreased by 47% from 1970 to 1995.

401 pedestrians, however, were killed in 1995 on Australian roads, and pedestrian fatalities represented20% of all people killed on road.

Pedestrian crashes cost the Australian community nearly A$1.0 billion each year.

There was almost double fatalities in male in comparison with female in 1992.

Children (defined as 16 or younger) make up 15%, and children under 6 years account for only 4% of the total.

The elderly are far more risk with 40% of all pedestrian fatalities over the age of 60 years, conceivably due to their inability of running, eyesight, listening the like as for accident causation.

(1) In 30% of fatal pedestrian crashes, the death of the pedestrian is instantaneous, a further 16% die before they reach hospital and 53% die in hospital.

(2) Over 2/3 of pedestrians suffered serious head injuries while 47% had serious chest injuries.

(3) As for crash site characteristics, nearly 2/3 of pedestrian crashes occurred on road where the speed

limit is 60km/h or less. 60km/h is the general urban speed limit in Australia as he mentioned today in the above context.

(4) As for point of impact on the vehicle, the majority (84%) of pedestrian fatalities involve the pedestrian being struck by the front of vehicle.
(5) Nearly half number of vehicles braked before striking pedestrian.
(6) As far as impact test is concerned, conceivably some consideration should be given in lower leg & knee impact test with bumper with a free speed or braking.
(7) Under harm reduction, design changes to the front of the vehicle which reduced the severity of impact between the pedestrian, especially the head of the pedestrian, and the body of the vehicle could assist in reducing the number of fatal outcomes in such crashes.
(8) The Federal Office of Road Safety has initiated a research program to assess the potential benefits from pedestrian-friendly vehicle design.

That program has been conducted by Mr. McLean's research unit and currently at stage of having aim, functioning head form which we will project EEVC head form and vehicle.

In reference to Doc. IHRA/PS/17, Mr. McLean stated that even if significant improvement results from "infrastructure" development, one can continue to expect each year about 25 to 30 deaths and 600 to 700 serious injuries among Australian pedestrians aged 5 to 12.
In his closing remarks, Mr. McLean indicated concerning accident investigations that his research unit is coincidentally being fronted to collect data on pedestrian collisions during current financial year which starts this month.

Mr. Sasaki questioned if Mr. McLean has data concerning the impact speed, making a quotation from Table 1 (Number of fatal collision in 1992 involving pedestrians aged 5 to 12, by road type and speed limit at site of collision).
Mr. McLean answered "Yes" having guessed from his memory, half cases in general must have past 60km/h based on 152 investigations estimated impact speed, as this table shows simply "speed limit at the site".

Mr. Jachn brought the issue up as a current topic in Europe, stating hard controversy between industries and TRL. They are dealing some investigations on infrastructure measures. And in addition, they offered cost benefit studies especially on EU Draft Proposal where there was big difference between ours and TRL.
Mr. Jachn raised a question concerning the controversial cost-benefit if TRL can estimate to materialize the vehicle without experiencing to develop the vehicles while all of us have estimated figures.

Mr. Lawrence urged that estimate was made by car design consultant, not by TRL.
Ms. Brun-Cassan pointed out that they don't care car design individuality of cars.
Mr. Jachn added his comments that even industries are investigating the problem of the style, taking the cost into account.
Mr. Jachn indicated that they are not ready to use Draft Proposal from European Commission due to some problems with impactors, i.e. repeatability & reproducibility, referencing their own studies.

Mr. Lawrence indicated that they have assessed the repeatability of impactors, all the impactors are very repeatable. The test procedure is rather problem, there is some very minor problem about head impactor, and leg impactor too, but will be completed by next month. Those impactors are being used in UK car assess program, and no problem using them in the test method.
Mr. Jachn and Ms. Brun-Cassan, however, denied the test repeatability of impactors.
Mr. Lawrence urged the test repeatability of impactor, stating impactors are themselves repeatable. They found problem in cars which may cause impactors not repeatable. Repeatability varies in cars.

Mr. Jachn deferred argument till tomorrow for further detailed discussion.
Mr. Sasaki outlined recent research on pedestrian protection conducted by JAMA (Japan Automobile manufacturers association) as follows;
started study in 1996, referencing police data
72-89 accident survey based on micro data base
88-89 study by computer simulation with pedestrian model
90- study test
90-95 study for NHTSA system
improvement point for head impactor
94 study compared with EEVC test procedure
96 validation on ISO procedure, particularly impact angel and impact mass
mid 91-96 study on impact test procedure with reference to leg & head

Introduction of the draft procedure
Prior to a proposal for drafting the test procedure by Mr. Sasaki, The Convener humbly interpreted this was made in order to initiate the activity as a tentative plan, and requested everyone to do their utmost for responses.

Accident Survey
Mr. Sasaki gave an overview of plan for accident survey and requested everyone for approval. (Ref. Doc. IHRA/PS/4)
The Convener requested everyone to input us as detailed as possible, gathering accident data from countries.
Mr. Lawrence raised a question concerning the definition of "passenger motor vehicles" used in the passage of the plan, that is difficult to define, stating that this definition is likely to include "buses & coaches" that we wouldn't like to combine.
Mr. Lawrence suggested, in reply to the Convener's question about what is the best international definition, that it's quite appropriate this research word "passenger cars" should be the word the individual country do best interpreted them so as to be able to quote appropriate data. "Passenger cars" include light commercial vehicles, and 4-drive off-road type vehicles as well in UK.
During the discussion of "passenger motor vehicle", the body understood there was confusion over the terminology, it should be clarified so as to be able to gather appropriate data from the countries.
The Convener requested everyone to provide us with his revised proposal on this terms and definitions tomorrow.

Review of fruits of past studies, and study on pending technical items
Mr. Sasaki gave an overview of plan for "review and study" of past studies and requested everyone for approval. (Ref. Doc. IHRA/PS/5)
The body approved the plan without objections.

Investigation of effect of investment in traffic safety facilities
This body decided this issue should be left out of plan.

Study of Biomechanics
Mr. Sasaki gave an overview of plan for "study on biomechanics".
(Ref. Doc. IHRA/PS/7)
The Convener interpreted the meaning of this plan, stating that there are significant discussions in progress how to do study on biomechanics referencing ; whether it should be done with dummy consuming time and money for development or if this should be done with components.
The Convener requested tomorrow's detailed discussions, although it will be fallen into endless.

No comments and objections were made concerning Mr. Sasaki's proposal however, this topic should be discussed further tomorrow.

Preparation of test procedure
Mr. Sasaki gave an overview of plan for "preparation of unified test procedure".
(Ref. Doc. IHRA/PS/8)
As far as Article No. 2 on page 1 of this plan, i.e. "the primary draft will be prepared by Japan", is concerned, the Convener put emphasis on the procedures and roll of Japan, so as not to cause misunderstanding, indicating that Japan volunteered to draft a final report to present to IHRA as a chair country on this matter, after reaching a consensus among countries concerned, by consolidating comments, gathering the activities.

In reference to open issue for tomorrow's detailed discussion, Mr. Saul raised a question how to build a consensus for development of IHRA, how do you see IHRA being consolidated by interacting together or separating both EEVC and ISO, because EEVC Draft Directives was already proposed in Europe, while ISO/SC10/WG2 is pursuing Standards.
In reply to his question, the Convener introduced WTO/TBT Agreement(*), as his individual opinion, stating that once ISO was set up, all country should use them as national standards and regulations, if they don't have appropriate reason.
Under the circumstance, IHRA should consist with ISO by means of harmonization somehow , although, he confessed he doesn't know, which part of them priority should be on.

(*)WTO/TBT Agreement (Agreemcist on Technical Barriers to Trade) prescribes to be exact as follows;
Where technical regulations or standards are required and relevant international standards exist or their completion is imminent, Parties shall use them, or the relevant parts of them , as a basis for the technical regulations or standards except where, as duly explained upon request, such international standards or relevant parts are inappropriate for the Parties concerned, for inter alia such reasons as national security requirements; the prevention of deceptive practices; protection for human health or safety, animal or plant life or health, or the environment; fundamental climatic or other geographical factors; fundamental technological problems.

Mr. Sasaki questioned the priority of both IHRA and ISO which of them should be adopted first, i.e. IHRA should pursue own activities so that ISO might be modified after all, or adopt ISO unconditionally as IHRA's ends.
The Convener answered his question that we have two alternatives for harmonization of the both, during the discussion of test procedures;
change ISO test procedures so as to be consistent with IHRA requirements
use ISO test procedures as IHRA's

In response to the Convener's explanation, Mr. Saul showed his concern if same discussion has taken place at the steering committee level of IHRA regarding IHRA and ISO. He felt that other groups, we have 6 projects, may as well have same philosophy.
The Convener felt that only what they concern is conceivably to harmonize IHRA among countries, without having no interest in ISO.

Mr. Yamaoka recommended, getting back the said issue on definition of "passenger motor vehicle", that we might as well use the definition quoted by EEVC or ISO or NHTSA ready to hand, for the time being.

Day 2 (Wednesday 16 July) Ministry of Transportation, Tokyo

The Convener opened the meeting at 9:30 with roll call of members newly joined today.
(See attached sheet Appendix 2)

Accident survey

Mr. Ishikawa reported the current situation of pedestrian accident in Japan, pointing the significant results with each figure, referencing Doc. IHRA/PS/10, /11,/12.

Constitution ratio of pedestrian age group by casualties and fatalities is likely as same as in other countries. (Doc. IHRA/PS/10)

Comparison of injury region by one bonnet type vehicle, cab over engine type vehicle the other showed leg injury with 45% and head injury with 20% by the former, while leg injury with 27% and head injury with 32% by the latter.
(Doc. IHRA/PS/10)

Comparison of injury region by AIS group with vehicle types showed relatively higher ratio in head injury / lower ratio in leg injury by cab over type against bonnet type vehicle. (Doc. IHRA/PS/10)

Chart on Relationship between AIS and vehicle speed identified in danger by driver showed that impact speeds were identified in danger with a ratio of 80% by drivers. (Doc. IHRA/PS/10)

Serious head injuries were attributed to by hood top / windshield, according to analysis by Table 1 "Number of pedestrian injuries by body regions and contact locations". (Doc. IHRA/PS/12)

Leg injuries were caused by bumper / hood edge. And many injuries due to contact with the ground. (Doc. IHRA/PS/12)

Fig 6 showed the distribution of head impact point by child / adult.
(Doc. IHRA/PS/12)

Ms. Brun-Cassan questioned, with reference to the above (7), an availability to formulate the data just like in Table 1, but with sever injuries and fatalities which stand for AIS more than 3.
Mr. Ishikawa committed himself to deliver it later on.

Mr. McLean questioned a consistency on both data, shown in Fig. 6 of Doc. IHRA/PS/12 and in Fig. 15 of Doc. IHRA/PS/11. The both are taken from the same source of data, but purpose Fig. 15 draws attention to statue of height of pedestrian having short pedestrians and very tall pedestrians, while Fig. 6 in Doc.12 shows distribution by children / adults. Compared with Fig. 15 which shows only 1 case, we see 6 cases contacting A-pillar in case of Fig. 6.
Mr. Ishikawa responded that data without height of pedestrian was deleted, and not counted in the Fig. 15 which stood for merely "up to 131cm" and "150 or taller", while all cases, 120 cases, were included in Fig. 6 in Doc.12.

Mr. Saul reported some noticeable data from "Technical Report" (Doc. IHRA/PS/13) from NHTSA issued in 1985, stating it appears to be old based on PICS data from '79 to '84.
Fig. 1 shows the distribution of number of pedestrian by age with high peak of 5-6years old.
Fig. 6 has distribution by body areas on top section which is broader description of body regions, the bottom section shows more fine divided body region.
Fig. 7 shows distribution by injury source, by what component. Environmental surfaces represent 40% of all injury sources. Hood was 13%, front bumper was 12%.
Highlight was Table 6 "injury importance by body area, body region and

severity", which shows distribution by body region and broken dawn by AIS, would show head represents the most important source of injury, followed by thorax.

Fig. 9 shows injury importance divided out by impact injury source of vehicle.

Vehicle face represents nearly 25% of injury importance, then closely distributed by the ground was the 2nd important region.

Mr. Saul indicated that it would represents grill, from bumper to before hood, in answer to Mr. Jaehn's question what is front face excepted bumper.

Mr. Jaehn outlined the trend titled "killed pedestrian per 1 million", which shows relatively old figures with the time frame from 1970's to 1975, but wished to look at the trend which has been decreasing in common in Europe.

In reference to Accident survey, the Convener reminded them to propose the definition of "passenger motor vehicle", which was deferred until today's discussion.

2. Study on Biomechanics

Mr. Sasaki gave an overview of the plan for "study on biomechanics".
(Ref. Doc. IHRA/PS/9)
The Convener, in this connection, questioned if members are able to provide additional information or data.

Mr. Lawrence, in answer to the Convener's request, made two comments on this plan, in reference to upper leg section on page 3 of the plan. TNO and TRL decided test conditions on EEVC test methods based computer simulations. With Impactor based on computer simulations and large program testing using pedestrian dummies, they simulated cars, not just computer simulations. They could meet simulations and large program testing whole range of different shape of cars, using both adult and child dummies.

They were dummies, adult dummy with modified to have a greater adoption of pelvis and hips, and it has knee clutches set to 200NM to simulate knee injury as well, cars, full sized cars, constructed with foam and significant parts constructed with foam so as to be able to measure force of inertia.

They conducted in-depth study from 87 to 89, and reported two papers to ESV on 1989.

The 2nd point Mr. Lawrence made was that Confor foam does have significant energy absorbing capacity, the party praised the performance of the impactor when testing cars, it will likely pass requirements if this is loaded. This matter was considered at some rank and file of EEVC when they drew up this recommendation.

Mr. Lawrence clarified the properties of "foam" by stating that its ability is to absorb energy but varies in temperature, because it is only capable absorbing load of small amount of energy, significant variation is no very large. When testing cars, it slightly meet requirements. If you test car that has no energy absorbing capacity, that defects foam and temperature on foam will have significant defect. When testing car that has energy absorbing capacity, that effects foam variation of foam by temperature is very small.

Mr. Sasaki questioned if Mr. Lawrence has some temperature data with him concerning upperleg.
Mr. Lawrence indicated that it was from committee paper, not with him.

The Convener suggested that Mr. Sasaki is to rewrite the plan, taking the two comments made by Mr. Lawrence into account.

Mr. Sasaki felt that it wouldn't need to rewrite the plan, but the problems should be noted down in the meeting minutes. Because "the plan" must have included many mistakes or misunderstanding itself.

The body didn't feel the plan is in need for a rewrite.

Mr. Jaehn requested Mr. Lawrence to make his comments more clarify, by questioning if they changed dummies to do testing with cars.
Mr. Lawrence replied that the dummies had been changed that may hit perform in more realistic fashion. So the pedestrian dummy was improved.
Mr. Jaehn questioned further what was a basis for this pedestrian dummy, and where did they take data from to test biofidelity.

Mr. Lawrence outlined, in answer to Mr. Jaehn's question, as follows;
It was a standard dummy biomechanical data taken on the ability of human being to adopt hip joint. Most pedestrian dummies, maybe all dummies, have limitation on movement with joint hip area, and these dummies modified so that it's available, i.e. movement was made most useful so that dummy could hit one side, and hip joint then swing the whole range travel.
And knee clutches will again compare with current biomechanical data for time and test on John Harris conducted with own knees to set a clutch, and also 200NM has been reasonable force.

Mr. Jaehn further questioned Mr. Lawrence on what he spoke of foam, by asking what do they mean by "soft".
Mr. Lawrence, however, indicated that he didn't say soft, he didn't say real cars.
Because they can't measure load in real cars due to inertia problems. These were to simulate cars full size. But the energy absorbing material was selected to be pedestrian friendly, because of its light weight energy absorbing foam one could measure force very small areas due to the inertia of moving material.

Mr. Jaehn raised a question again what does Mr. Lawrence mean by bonnet of soft foam. Because they have been looking for solutions as a manufacturer, and what could be solution for developing pedestrian friendly cars. How did you do it.

Mr. Lawrence indicated that all this was reported in ESV Conferences, but tried to help Mr. Jaehn describe these things.
Car was constructed with immovable energy absorbing foam, for instances, bonnet leading edge was covered layers of mounts 2-3inches of very stiff energy absorbing foam. And bumper region also covered layers of about 100mm very strong energy absorbing foam, and all adjusted so they have generic type car covered whole range. Main phase testing was done at 40km which is the proposed test speed for always registration that EU is considering.

Mr. Jaehn indicated that they have done same test but they couldn't find a solution.

Mr. Lawrence indicated that there is no suggestion in this car. They presented shape of practical car and it has capacity like a practical car, energy and force calculations, particular force measurement, be made which can not made of practical cars, when you have inertia problems in measurement system.

Mr. Bartolo raised a question if there was no feasibility study from vehicle design impact.

Mr. Lawrence answered with "yes", and explained as follows;
As well as this study, which was done to aid selection of impact criteria we also produced demonstration car in '85 which had lot of features to pass current proposals.

Ms. Brun-Cassan, however, indicated it was never tested according to the actual EEVC procedures.

Mr. Lawrence stressed again that none of modifications for pedestrian purposes effected in car performance in detrimental fashion for other tests, and most of test results showed increased energy absorbing capacity.

Mr. Jaehn pointed out that front impact might cause problems not only the capacity of energy absorption for pedestrian but also that for occupants. Soft nose of car might be much problem for occupants due to more severe accidents.

Mr. Lawrence urged that pedestrian improvement put on the car didn't have any detrimental effect on performance for occupants, only effect they have an extra energy absorbing capacity.

During the discussion on the compatibility of pedestrian and occupants, in this context, Mr. McLean voiced complaint, and registered objection to the questions made by Mr. Jaehn concerning the negative effect of foam on occupants protection, by stating that Mr. Jaehn is a observer, not a official expert, according to Australian Government. Most of questions asked Mr. Lawrence he should not need to ask, and Mr. Lawrence suggesting that modification for front vehicle needs to take into account occupants protection is obvious. Future discussion must be more constructive, otherwise it's waste of time for committee.

The Convener stressed again that participants today were all members recommended by each Government, no observer here. Australian Government rather made misunderstanding on this matter. And the Convener requested members to maintain the constructive discussion.

Mr. Jaehn took back his last question to Mr. Lawrence, admitting it was inappropriate.

Mr. Lawrence presented hesitatingly his tentative suggestion that "passenger motor vehicle" the scope of plan prescribes should be defined M1, N1 incl. commonly described as cars pick-ups, sports utilities and light commercial van.
Mr. Jaehn suggested they should take as same definition as submitted to EC Commission.
Mr. Lawrence indicated that they had been careful to define them focusing on around European cars to draw up Draft Directives. In the Draft Directives we proposed more restrictive, and it defined M1 and N1 derived M1, that is only commercial vehicles based on cars. We have to take in internationally wants in defining the terms.

The Convener introduced ISO definition to be "vehicles upto 3.5t gross mass".
Mr. Jaehn proposed to put M1 as interim definition for now, then discuss it at the next meeting, after getting information with reference to another vehicles and figure it more in detail. Because they are unable to figure it out with fatalities and injuries caused by heavier vehicles like light truck.
Mr. Saul also wondered light truck seems to be heavier than we would want to consider for pedestrian safety.
Mr. Lawrence indicated that it's hard to justify the test procedure for such heavy vehicles going into force in Europe, having involved just few accident. We need to consider about another countries, put in American and Australian instances.

The Convener suggested that we first put M1 at least as a interim definition, then we might as well finalize at the next meeting, adding other vehicles on M1, if necessary. In this context, the members were encouraged to provide their proposals and definitions at the next meeting.
The plenary agreed with the Convener's proposal.

The Convener requested that each member investigate accident survey reported by countries, classify

data to adopt the data for test procedures.
Mr. Sasaki proposed everyone to input updated data to meet 8 requirements proposed according to "required data" listed in accident survey procedure (Doc.IHRA/PS/4)

Mr. Saul felt that it's probably sufficient with the current data. US is already collecting information, it's very difficult to talk additional information, considering the time frame, though he isn't sure what other countries is doing.

The Convener encouraged everyone to make efforts to gather the updated data and in-depth study available by each county targeted by early spring 1998, although some countries might have difficulties in fact.
The body approved the Convener's proposal without objection.

During the discussion of accident data, the Convener brought the issue up what is a primary body region for test procedure, i.e. leg from the perspective of frequency and/or head from severity.
Mr. Sasaki suggested parallel & simultaneous as a way of approach that member countries should take a roll to address their own allocation in parallel in order to accelerate the procedure by maximizing their time and efforts, since it has taken 10 years in development of EEVC Draft Proposal and been taking more than 8 years for preparation of ISO Working Draft.

Mr. Saul offered a couple of thoughts, in this context, as follows;
In the ESV/IHRA Project Pedestrian Safety PLan, US was proposed to develop full scale crash test dummy, NHTSA, however, has no plan this time at least to develop such dummy. US is proposed their response for that they are to put together draft plan which they can bring back to the meeting next time. Certainly they want to incorporate the pedestrian dummy as one of the thought options, want to include that consideration in possible direction.
However, he personally thought that development of pedestrian dummy is need of a long term process. He suspected that they will have a great difficulty trying accomplishment in 4 to 5 years for time frame. Mr. Saul further felt that we can see parallel activities the body will take as we have an agreement at the next meeting. And if we use as a basis ISO procedure already developed for leg & for adult head, all of accident data has shown large components of accident cases occurred to children. He guessed maybe attainable goal is to try filing test procedures for child head form. For that purpose, EEVC already has proposal which we might use as a potential basis for that we might want to discuss.
Mr. Saul guessed part of reasons as follows;
Very important issue US is experiencing now is airbag that have already been developed with 50percentile male dummy those are being considerably criticized. It's not providing adequate protection for children and small women. He thought perhaps they should take same consideration than pedestrian issue.

Mr. McLean indicated, in answer to the Convener 's query on pedestrian dummy, that there are components test in progress for next 2 years in Australia, it will require works for years to design dummy, build and run prior to validate, although he can see many attractions.
Mr. Lawrence further pointed obvious facts out that the height of dummy to large extent would be defined with head impact locations and prior to putting it into development of dummies we should maybe give some further thoughts to what would be used for. He indicated that they can certainly see margin using it to validate any interactions between component tests, but seem quite a wide range of dummies with different size would be needed for being particularly useful. It would be much more so in a way than for vehicle occupants.

Ms. Brun-Cassan also questioned why Japanese are need for complete dummy, now that we began to work for the component procedure i.e. ISO procedures. It's unable to understand what there will be a

relation between two test procedures, and what we can assess with complete dummy test, the result being time consuming.
She also put emphasis on the fact that more biomechanics data are required prior to development.
Mr. Saul supported Ms. Brun-Cassan's opinion, stating that one issue would be having wrap around repeatability with not flexible spines, and doesn't know how flexible spines are in European dummies, but NTHSA's dummy is currently being not flexible spines. Biomechanics data to determine the proper spine flexibility is needed. Also many issues like neck response, head response, thorax response should be decided and come into an agreement.

Due to the body's negative views, the Convener confirmed that we are to leave the pedestrian dummy out from the draft plan, by stating it's hard for 99% to carry it out within the time frame of this project.

the Convener made a proposal to get the investigation started with components (not a dummy) of both head and leg.
Mr. Bartolo suggested that we investigate the EEVC procedure with consideration for containing 6 years child head & leg, but focus on head for 50 percentile adult male, 6 years child head and leg for adult.

Mr. Lawrence indicated in principle we need to establish which zone, who is most risky, and in each area we need to consider whether who is the most risk from the particular parts of car, and design test tools as an appropriate for that person on a basis of lessen risks. We can't have data concerning whole range of impactors representing different ages, but maybe there will be possibility to be able to make use of ISO and EEVC procedures, adjusting the conditions so as to cover from bigger range to smaller range including children and small female.

Mr. Saul raised one point we lost during this discussion that we have to consider the fact that vehicle design and profile has changed over the years, most likely they are continuing too. He indicated that our test procedure is needed to be updated in compliance with future car design and profile, keeping remind us that it's necessary to reflect a change in the process.

Mr. Bartolo raised a question, during the discussion of component testing. He expressed concern from the standpoint of individual component and subsystem testing, i.e. bumper, hood, leading edge. Consideration must be given to the development of a test procedure from a "total systems" approach with regard for all other vehicle requirements. He doesn't know how that fits in, but the issue needs to be presumed on systems basis from the standpoint of manufacturers.

Mr. Lawrence put a question to Mr. Bartolo, stating he is not quite sure what you mean by systems.

Mr. Bartolo took an instance of bumper to explain the meaning of system as follows;
A pedestrian friendly bumper may result in conflicting constraints required to meet other regulatory standards like bumper damageability, crashworthiness or projections. For example, head impact testing and design of hoods must take into consideration the complete vehicle effects like; underhood engine package, proximity of hardpoints and driver visibility.

Mr. Lawrence replied to Mr. Bartolo's indication that, speaking of compatibility, part which has to be pedestrian safety also has to serve as functions, and the hood areas as well as providing head protection also has to have for engine and center pieces which keeps car going. He felt that to a degree these problems are to be addressed by political decision. You have test method that is to assess the safe car / risks, some contradiction between requirements all having crash performance and essential components. Then to a degree those problems can be resolved by changing design, maybe there is a need for some compromise. Those decision do not be on the part of designer of test methods, more

political decision as to how much efforts put in, how many people we can try to save.

Mr. Bartolo agreed with Mr. Lawrence, stating that it is probably a complex issue that requires thorough consideration.

Mr. Jaehn, however, raised a question to Mr. Bartolo regarding soft bumper that they might fail in occupants test, i.e. front impact test, because changing to flexible grill that might be possible to certain extent, but that forces industries to develop new restraint system that ensures more occupants protection costing for development of new restraint system. They have to face contradiction, i.e. pedestrian safety is one thing, occupant safety and other car requirements another.

Mr. Bartolo answered that he wasn't trying to suggest one of trade-off commercial aspects for pedestrian safety aspect, which are difficult decisions some body must make at some point in time. What he is trying to say from stand point bumper softness, they got now even more detailed on bumper damagebility requirements in the US and Europe, lower speed impact damagebility for insurance ratings, crash sensor deployment, and the implications of making minor changes that a involve systems approach. Guessing from components test standpoint, the best solution in an isolated environment for head impact protection will perform differently with each engine package, that may affect results from the systems complexity point of view. Again Mr. Bartolo emphasized the necessity for taking a viewpoint from a total systems and vehicle perspective.

Mr. Lawrence pointed out that there would be one slight misconception during the discussion on the soft bumper, stating pedestrians are comparative tough and the requirements are near limit what human can injure. So spoke of soft bumper, it's not so soft as to what we visualize, test procedure with current cars could pass at ease meeting bumper requirements, presuming to provide best occupants protection. It's possible to design bumper systems that would be pedestrian friendly, and also perfect design bumper compatible with pedestrian requirements, occupants protection requirements and vehicle design requirements.

The Convenor proposed members to reach a consensus concerning items to initiate, stating "start study focusing on component tests procedures for adult and child head".
Mr. Sasaki, however, questioned what the Convener means by "start study", if it means drafting procedures from now on or not.
The Convener interpreted the purpose of this group that is to propose a reasonable test procedures, drafting the test procedure. But investigations are needed to initiate, prior to drafting.
Mr. Sasaki couldn't understand further. there was insignificant discussions among the Japanese as to how to do "start study".

Mr. Ishikawa indicated that he found some significant injury distributions that differs from vehicle shape according to the recent data which was reported this morning. He is concerned that EEVC test procedures are based on old accident data 10 years before, in particular as far as bonnet leading edge test procedure for upper leg is concerned, the 20 Euro cars coulda't meet the requirements of EEVC test procedures posed by Euro NCAP test.
He also indicated that he couldn't see any severe injuries in the latest models, and pointed out a need for further information gathering recent accident data.

Mr. Jaehn agreed to Mr. Ishikawa's proposal of gathering recent data, by stating they are prepared to get data at least since half a year or a year ago for the next meeting.

Mr. Yamaoka expressed his concern about technical materialization (i.e. system) of a car itself, requested to address the issue in more detail and timetable that they expect to follow in the course of

technical investigation proposed by the plan (IHRA/PS/2) possibly at the next meeting.
Mr. Yamaoka further committed himself that JAMA will be prepared to come up with a technical investigations, and will request ACEA and AAMA to deal with the issue together.

The Convener brought a question up what the items or issues are to be addressed at the next meeting, whether or not accident data are updated by the next meeting.
Because if this working group does not taking any action to go on, the process will fall further and further behind.

Mr. Lawrence interpreted the bottleneck we are encountering and suggested as stated below;
There appears to remain a need unchanged for updated accident data and for discussion on how we can gather accident data to proceed with the test procedures though. His suggestion is that we start drafting on a basis of existing such test procedures as ISO / EEVC given sanction to accident data currently available, although the number of pedestrian injuries are dramatically declining.
Still we need for significant test tools that is being discussed by ISO and EEVC. We should work on a basis of those test methods adopting in IHRA. As soon as accident data that is to be updated conflict with those sanctions, then add to test procedures or modify test procedures.

Mr. Ishikawa agreed to start drafting with head and leg test procedures while he stressed again the need for new accident data in other test methods.

Mr. Lawrence pointed out that concerning upper leg test by EEVC, since the 1st development, the criteria was derived from weak people based on very limited accident cases. There used to be tend to select weak people in proportion to strong people. Since then they have improved impactor, having reconstructed based on a limited number accident cases. Their findings are the fact that they had again weak people. Only problem with upper leg test procedure is that the criteria need for a review, and currently they are officially square bracketed.

Despite Mr. Lawrence and Mr. Ishikawa's suggestions, the Convener didn't clarify the said two alternatives but repeated to bring a question up what the items or issues could be addressed at the next meeting, and requested members to get back with the updated data, stating that in order to "combine many things he would like you to study, based on accident studies presented yesterday and today. Items to study or start with maybe be head for adult & child and leg for adult, although final proposal should reflect updated data."

The Convener felt that Japan will be able to submit new data at the next meeting, and expressed his expectation that US, UK, France and Germany could gather data.

Mr. Lawrence responded that he would try to ask German data, since UK data base has not yielded any in-depth results yet.
Mr. McLean felt that Australia could input excellent data by this fall.

The Convener requested members, getting back to the said alternatives in this context, if how we should get the issue concluded.

Mr. Saul pointed out that if we look at child head test procedure, how we could compare US's and EEVC's in terms of child head mass. That would be potential topic that needs for discussion and agreement. Another point is as to how we obtain access to biomechanics, some discussions among this experts group will help us better understanding.

Mr. Jaehn raised a question with reference to biomechanical data if we should wait for studies some

countries work out, or adopt studies from EEVC or ISO. He requested to make direction clarify.

The Convener, however, appreciated Mr. Jaehn's indication, stating that is good point. And asked members availability of new data before long.

Mr. Ishikawa clarified their prospect with regard to high speed impact tolerance of knee joint that is scheduled to be presented at the STAPP Conference. Hopefully they are inputting to us in detailed after STAPP.

Ms. Brun-Cassan confirmed that Mr. Ishikawa is going to present a new biomechanical data (incld. knee characteristic) at STAPP Conference, and that was lately performed based on a "cadaver test".

Mr. McLean felt that, as far as head tolerance is concerned, he wouldn't expect significant additional information be in next 1-2 years, but maybe might be in 2-3 years.

During the discussion of new biomechanical data, Mr. Sasaki raised again a need for data for the development of full scale dummy.
The Convener interpreted that the issue is hardly to perform within term, stating "it's nearly impossible to include in the project, because of time frame, according to Mr. Saul's explanation. But we would like you to provide us with the updated information and situation".

Mr. Saul briefly replied that we will take a look at and see we think required.

The Convener suggested in this context that we should use tentatively components test.
Mr. Saul indicated that thorax would be the significant body region to deal with at the next stage, taking it into consideration for development of the plan.

In reference to study of "infrastructure" described in 5-4 on page 4 out of the plan (IHRA/PS/3), after investigation and discussion based on Mr. Lawrence's modification on infrastructure, i.e. "infrastructure would not be undertaken, but the value of infrastructure should be acknowledged", the article was proposed by Mr. McLean and changed to;
"The study of the effects of investment in traffic safety facilities (infrastructure) is not within the scope of the work of this group. However the importance of the role of the traffic safety infrastructure in pedestrian safety is acknowledged."

Mr. Bartolo indicated in this context that the importance of education and infrastructure should be stressed more for reduction of number of accidents. Although he doesn't necessarily disagree with the proposed sentence, he felt that the group doesn't need take a more works on infrastructure. However he indicated that these factors must be understood and taken into account when one decides which measure is most effective. He suggested that in order to reduce the incidence number, two way of contributions taken by industries and rule maker are measurable, giving an quotation that is related to the tendency in the State that fatality rates are much higher on rural streets rather than on urban streets due to the higher rate of speeds involved where vehicle designs may not be effective and each local area may have a different situation.

Mr. Jaehn committed himself that they will be able to provide us with recent investigation on infrastructure measures, having asked local Government about a course of single measures to protect pedestrian.
They investigated the data before and after measuring, what happened by a new single measure. He felt that this investigation will help us to consider and decide to use test procedures.

Mr. Saul indicated that this included from one source, but pedestrian situations are very different from base countries.

Mr. Jaehn replied that they are able to provide data from 2 or 3 countries, not all over the countries.

The Convener interpreted the status of "infrastructure and education" to be exact as follows;
"Our task is to propose test procedures for pedestrian safety, but to promote pedestrian safety, there are many measures, including infrastructure improvement, education, ITS accident avoidance etc. But we should focus on vehicle vs pedestrian within our team, touching on "infrastructure & education in the "introduction".

The body further couldn't come an agreement on this description of "infrastructure" proposed by Mr. McLean, the Convener requested members to submit their comments / modifications / proposals in writing for finalization at the next meeting.

The body agreed to hold the meeting twice a year between steering committee, supposed in Feb in the State, in conjunction with SAE Conference.

The Convener adjourned the 1st expert meeting at 16:30, 16 July 1997.
He thanked everyone for a successful meeting.

Attendees of Experts at 1st Meeting of IHRA P/S (July 15-16, 1997)		
Name	Organization	Cou
Dr. Jack Mclean	Road Accident Research Unit The University of	AUSTRA
Mr. Graham Lawrence	TRL Transport Research Foundation	U.K.
Dr. Roger Saul	NHTSA Pedestrian&Applied Biomechanics Division,	U.S.A.
Mr. Norbert Jahn	ACEA	GERMA
Dr. Francoise Brun-Cassan	ACEA	FRANCE
Mr. Manuel Bartolo	AAMA Advance Vehicle Safety & Regulation	U.S.A.
Mr. Atsunori Tanaka	AAMA	U.S.A.
Mr. Akira Yamazaki	JMOT	JAPAN
Mr. Ikuo Nakatani	JMOT	JAPAN
Mr. Shinichi Yahagi***	TSNRI	JAPAN
Mr. Akira Sasaki	JASIC (JAMA)	JAPAN
Mr. Hirotoshi Ishikawa***	JASIC (JARI)	JAPAN
Mr. Tetsuo Maki	JAMA	JAPAN
Mr. Fumio Matsuoka***	JAMA	JAPAN
Mr. Shigeyuki Yamaoka	JAMA	JAPAN
Mr. Hideo Kamata	JAMA	JAPAN
Mr. Atsushi Fujimaki**	JAMA	JAPAN
Mr. Takao Dohi**	ITARDA	JAPAN
Mr. Hiroshi Ishimaru	JSAE	JAPAN
Mr. Tsuneo Kamitamari***	JARI	JAPAN
Mr. Yoshiyuki Mizuno *	JASIC	JAPAN
Mr. Isamu Ishigaki	JASIC	JAPAN
Mr. Tadaomi Akiba	JASIC	JAPAN
NOTES: * Chairman, ** July		

LIST OF DOCUMENTS (IHRA Pedestrian Safety W/G, July 15-16, 1997)

No.	Submitted by	Title
IHRA/PS/1	JAPAN	PROGRESS REPORT I IHRA/PEDESTRIAN SAFETY
IHRA/PS/2	JAPAN	PROGRESS REPORT II IHRA/PEDESTRIAN SAFETY
IHRA/PS/3	JAPAN	ESV/IHRA PROJECT PEDESTRIAN SAFETY PLAN
IHRA/PS/4	JAPAN	ESV/IHRA PROJECT PEDESTRIAN SAFETY ACCIDEN
IHRA/PS/5	JAPAN	ESV/IHRA PROJECT PEDESTRIAN SAFETY REVIEW
IHRA/PS/6	JAPAN	ESV/IHRA PROJECT PEDESTRIAN SAFETY SURVEY
IHRA/PS/7	JAPAN	ESV/IHRA PROJECT PEDESTRIAN SAFETY STUDY O
IHRA/PS/8	JAPAN	ESV/IHRA PROJECT PEDESTRIAN SAFETY PREPARA
IHRA/PS/9	JAPAN	ESV/IHRA PROJECT PEDESTRIAN SAFETY REVIEW
IHRA/PS/10	JAPAN	Current Situation of Pedestrian Accident in Japan
IHRA/PS/11	JAPAN	The Present Situation of Pedestrian Accidents in Japan
IHRA/PS/12	JAPAN	Current Situation of Pedestrian Accidents and Research
IHRA/PS/13	USA	Technical Report Problem Determination, Vehicle/Pedest
IHRA/PS/14	POLAND	Present Situation of Research on Pedestrian Safety in Pol
IHRA/PS/15	JAPAN	DRAFT AGENDA, The 1st IHRA/Pedestrian Safety W/G M
IHRA/PS/16	AUSTRALIA	PEDESTRIAN FATALITIES IN AUSTRALIA
IHRA/PS/17	AUSTRALIA	PEDESTRIAN CASUALTIES: CHILDREN IN EARLY SC
IHRA/PS/18	EEVC	Costs and benefits of the EEVC pedestrian impact require
IHRA/PS/19	EEVC	A REVISION OF THE TRL PEDESTRIAN COST BENEFIT
IHRA/PS/20	EEVC/CEVE	EEVC Working Group 10 Report Proposals for methods t
IHRA/PS/21	EC	DRAFT, PROPOSAL FOR A EUROPEAN PARLIAMENT
IHRA/PS/22	USA	U.S. Research Activities
IHRA/PS/23	AAMA	COMMITTEE ORGANIZATION CHART(, etc).
IHRA/PS/24	ACEA	Figure 13 Degradation of Foam Properties with Use - Ne
IHRA/PS/25	EEVC	(handwriting note)

INTERNATIONAL HARMONIZED RESEARCH ACTIVITIES
STATUS REPORT

Priority Research Program: **Biomechanics Research**

Lead Country: **United States**

Lead Country Contact: **Dr. Raymond P. Owings (USA)**

Working Group Chairman: **Dr. Faris A. Bandak (USA)**

The first meeting of the IHRA Working Group on Biomechanics Research was held in Hanover, Germany, on September 22, 1997 in conjunction with the IRCOBI Conference. The meeting was attended by Dr. Wismans and Dr. Cesari representing the EEVC, Mr. Dalmotas representing Canada, Mr. Ono representing Japan, and Dr. Bandak representing the United States.

MEETING PROCEEDINGS

1. Opening

Dr. Bandak gave the opening remarks and thanked Mr. Dietmar Otte and the IRCOBI organizers for graciously providing meeting facilities.

2. Presentations

Each member opened with a discussion of his respective country's harmonization priorities and a brief description of on-going candidate research areas for harmonization.

2.1 Mr. Dalmotas emphasized the high priority of exploring sound alternatives as replacement candidates for the current HIC as a measure of closed head injury. He also reiterated the need for obtaining a biofidelic neck to alleviate the current response inadequacies that the current Hybrid III-type necks exhibit for rear impacts, child and small female representation, and combined neck loading assessment. Mr. Dalmotas informed the Working Group of Transport Canada's efforts to develop a means for interpreting output for Hybrid III legs to satisfy the current urgencies in light of the current absence of an alternative.

2.2 Mr. Ono presented the harmonization priorities for Japan emphasizing the need for harmonization of injury criteria and dummy development for side impact, child injury, frontal, and rear impact. He highlighted the differences in evaluation criteria between dummies and the existence of multiple dummies for the evaluation of the same type of restraint system. Mr. Ono also pointed out that it is necessary insure that the leg has higher biofidelity for full frontal and offset impact conditions. He also indicated the desire for further international cooperation facilitating the development and eventual adoption of the THOR dummy.

2.3 Dr. Cesari discussed on-going research addressing the need for the establishment of head/brain and neck injury mechanisms and tolerances for the purpose of proposing testing specifications for motorcycle safety helmets.

2.4 Dr. Wismans emphasized the need for research to identify injury mechanisms and provide low level neck response characterization for whiplash injury. He described on-going research in that area and in the area of side impact dummy biofidelity evaluation and enhancement. He announced the start of a 26 month program called SID-2000 that will produce side impact dummy design enhancements and injury risk functions. He updated the group on the whiplash research and the ADRIA (Advanced crash Dummy Research for Injury Assessment in frontal test conditions) programs to address injury biomechanics and dummy development for whiplash injury and frontal impact injury respectively.

2.5 Dr. Bandak emphasized the future needs for the development of advanced frontal dummies and the current needs for cooperation on a set of up-to-date harmonized injury reference values for the family of Hybrid III dummies. He discussed NHTSA's on-going projects on head/brain and neck injury, chest injury, and ankle injury. He informed the group of NHTSA's side impact research and Hybrid III dummy (5th, 95th, 3 & 6 year old) testing and evaluation. He also emphasized the need for a harmonized biomechanics data exchange protocol and presented the NTBRC approach. Dr. Bandak also discussed the need for standardizing computer models and computer codes.

3. Agreement on Recommendations

The group agreed on recommendations related to the areas below with the following order of priority:

3.1 Frontal Impact

In light of the areas of research on-going in the various member countries related to frontal impact biomechanics the Working Group recommends that high priority be given to head/brain/face, neck, chest/abdomen, and lower extremities injury research. The group also recommends cooperation on the development and evaluation of the advanced frontal dummy (THOR) under development by NHTSA.

3.2 Side Impact

The Working Group recommends that high priority be given to the generation of harmonized strategy for the development of advanced world side-impact dummies. Assessment of the state of the existing side impact dummies, supporting biomechanics, and injury data is on-going as part of programs within the member countries. This presents a significant leveraging opportunity for cooperation in the development of advanced dummies for side impact addressing the issues of injury criteria, biofidelity requirements, and dummy sizes.

3.3 Whiplash

The Working Group recommends cooperation in the area of neck injury criteria development

including low level injury. Priority is recommended for research in injury mechanisms, low level neck response characterization, dummy and test procedure development.

3.4 Child Dummies

The Working Group recommends evaluation of recent testing (conducted by the member countries) on current child dummies that will help form the basis for IHRA Working Group recommendations on the development of a family of advanced child dummies. The Working Group recommends a two year period for this evaluation.

3.5 Data Harmonization and Exchange

The Working Group recommends that the new database approach, under development by the NHTSA National Transportation Biomechanics Research Center, be evaluated by the member countries for possible acceptance as the framework for data exchange and harmonization.

3.6 Computer Modelling

The Working Group recommends the creation of a steering subgroup to work as part of the IHRA Biomechanics Working Group to oversee a two-year study for the evaluation of the current modelling activities on-going by the member countries. The Steering Sub-Group on Computer Modelling shall then recommend possible approaches to the harmonization of computer models and programs.

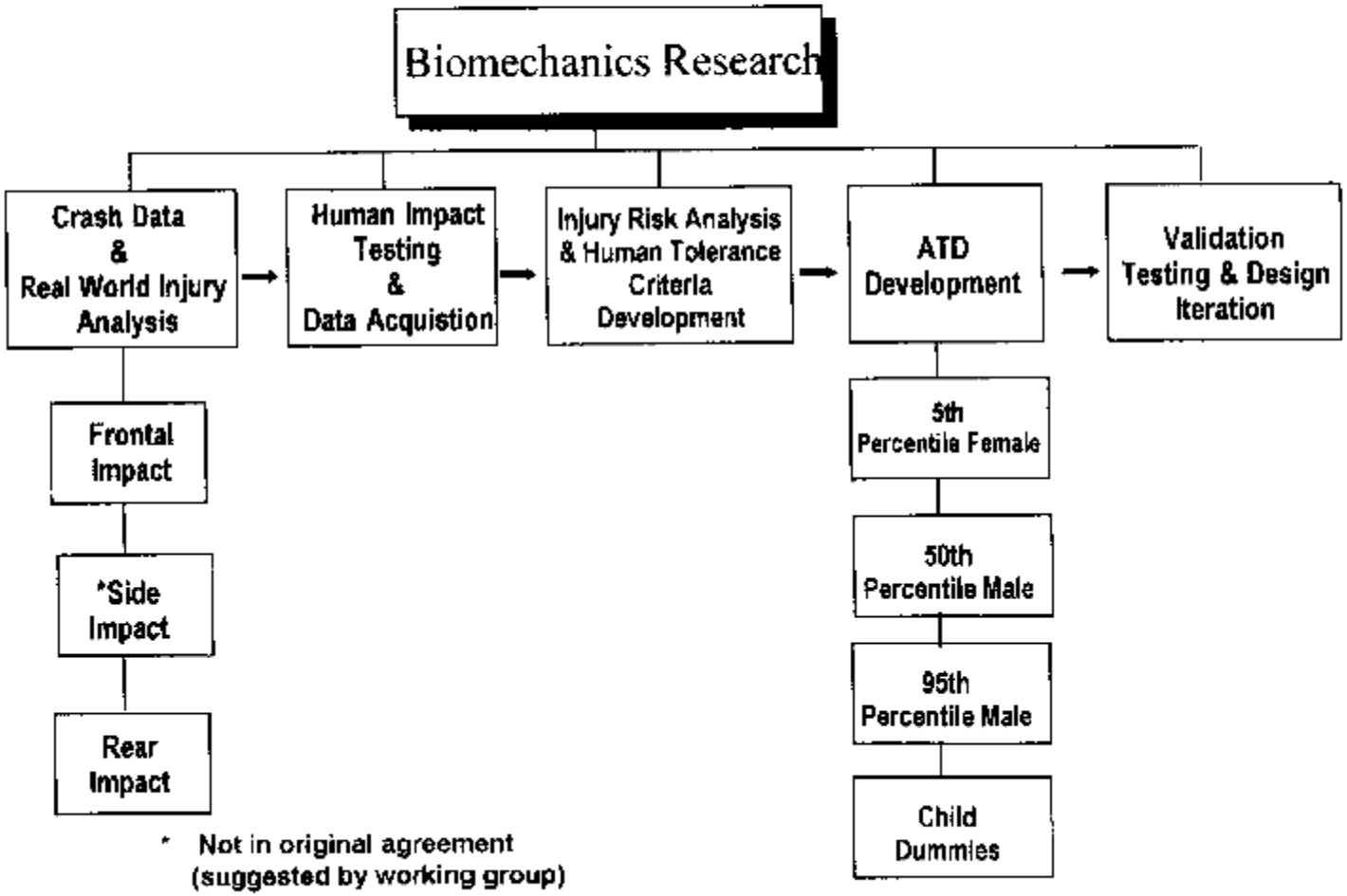
3.7 Industry Representation

The Working Group recommends that three industry representatives be invited as members of the IHRA Biomechanics Working Group with one member representing each of, North America and Australia, Japan, and Europe.

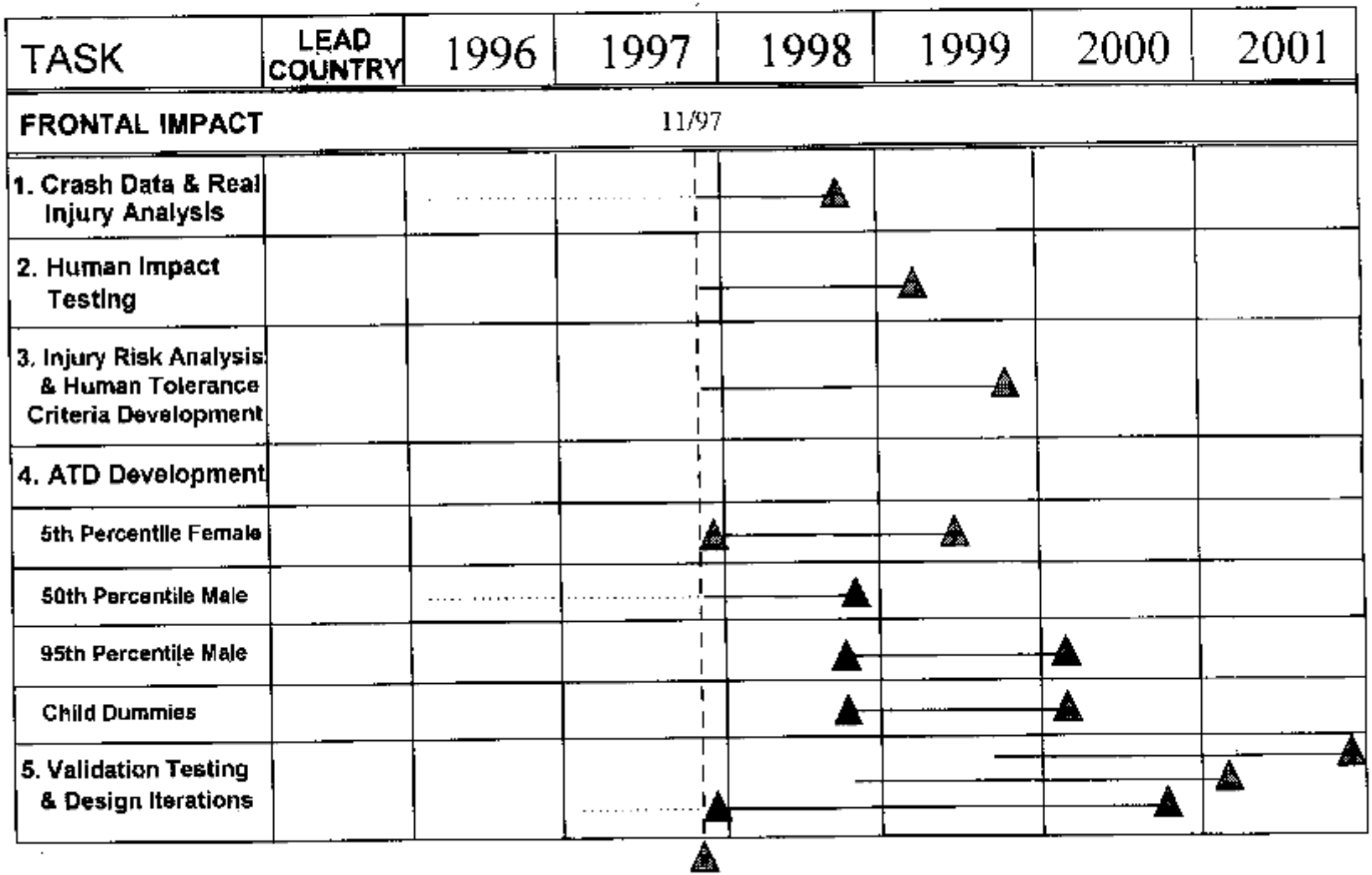
4. Next Meeting of the Working Group

The next meeting of the Working Group is being planned in conjunction with the Stapp Conference.

International Harmonized Research Agenda
Biomechanics Research
Lead Country: USA



Biomechanics Research



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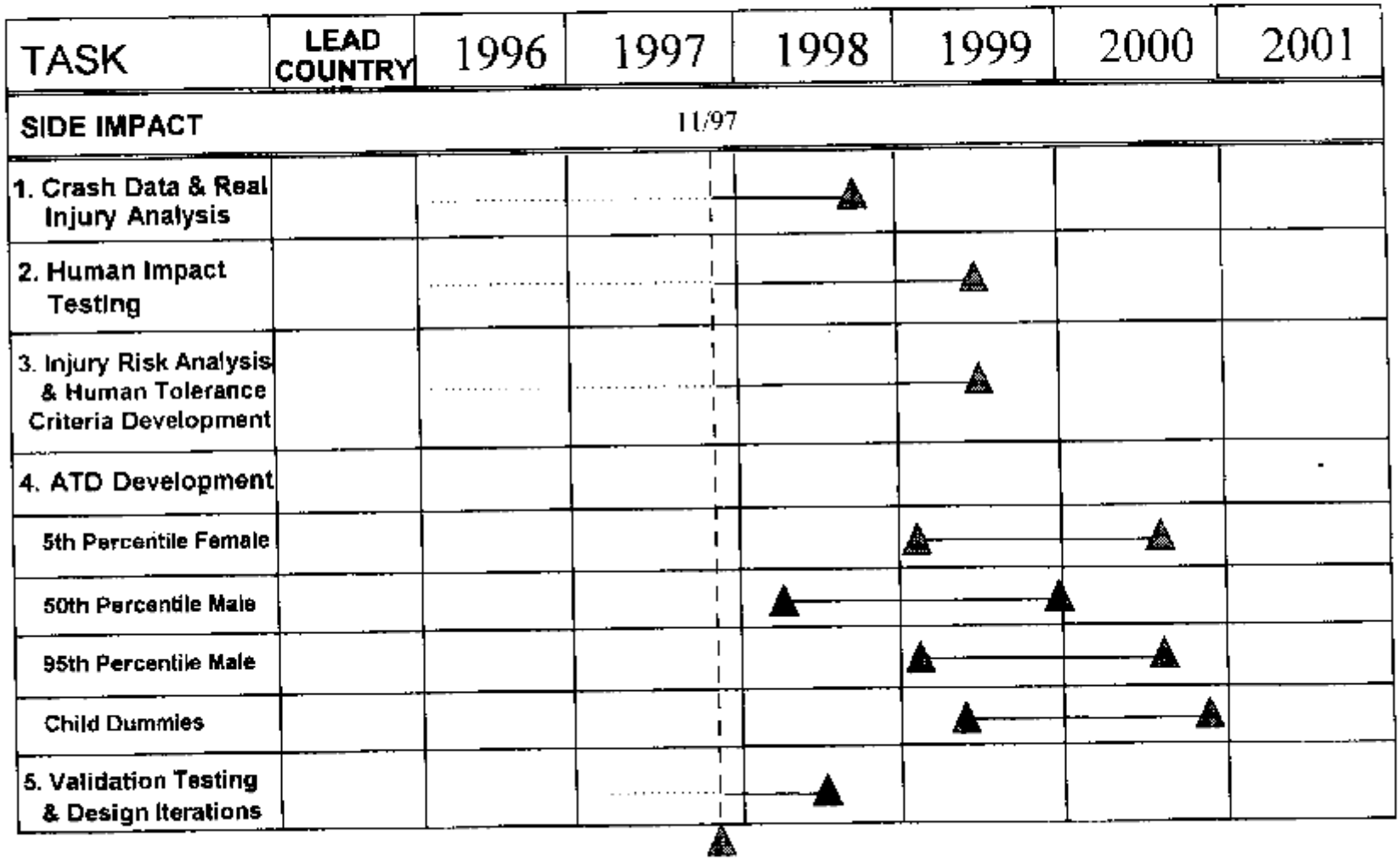

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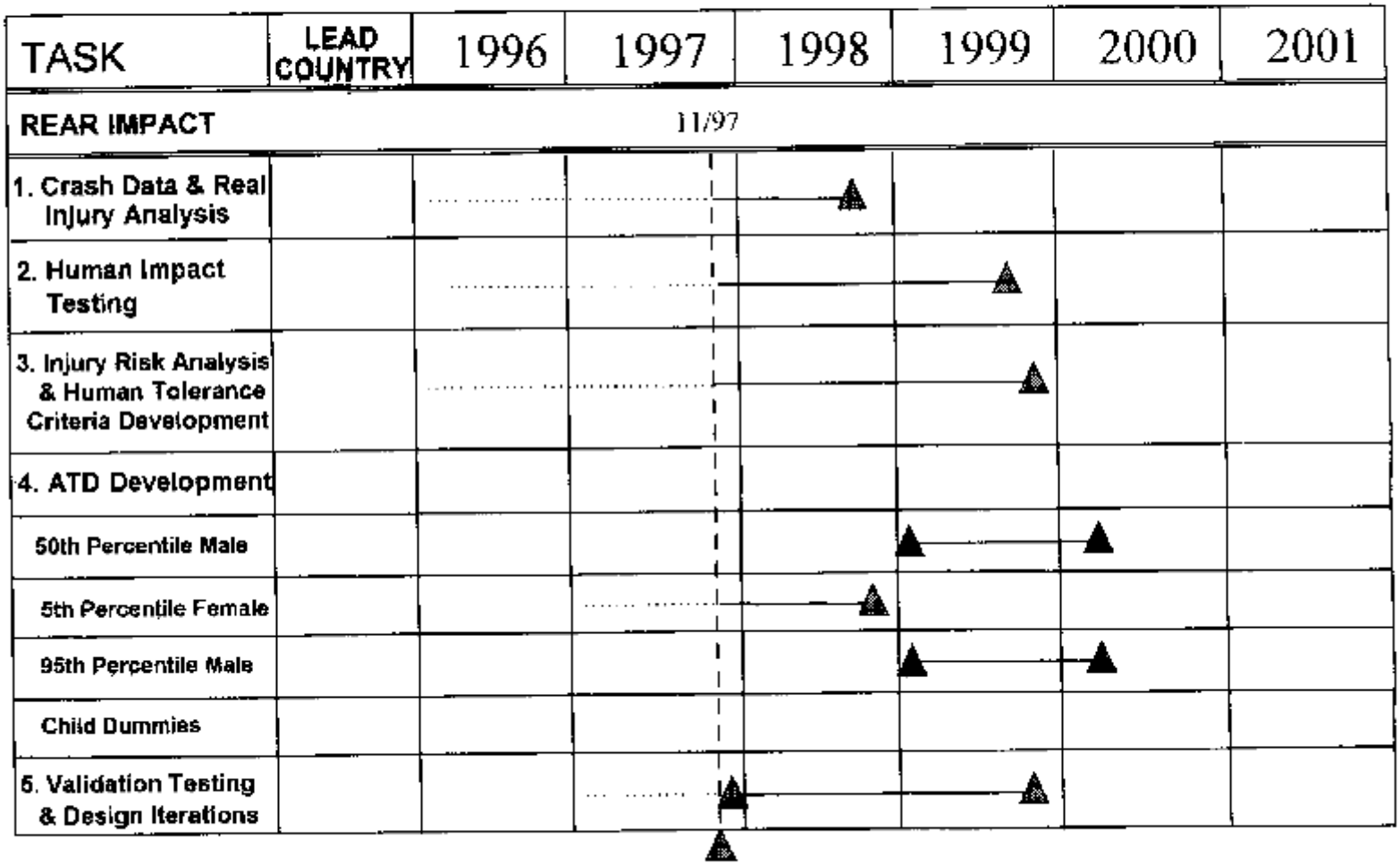

ROMA 29/09/97

STATUS REPORT OF THE 1ST ADVANCED OFFSET FRONTAL CRASH PROTECTION GROUP
(Based on the results of the meeting held in Rome on 29th September)

Participants: C. Lomonaco (Chairman, Ministry of Transport of Italy), R. Lowne and A. Hobbs (EEVC), T. Hollowell (NHTSA), D. Dalmotas (Ministry of Transport Canada), K. Oki (Ministry of Transport Japan).

INTRODUCTION

The chairman resumed to the participants the scopes and the goals of the working group, remarking that the work program has to be finalised within five years and it should be set into the following deadlines:

1. **ESV Windsor Conference**
   Presentation of the first report which contains the determination of research specific aspects and the working program launching focused on the drawing up of a technical standard on frontal crash protection.

2. **End 1999/beginning 2000**
   Completion of the technical standard project and validation program launching.

3. **ESV 2001**
   Work completion and technical standard project presentation to the ESV conference.

It was remarked that basically two main developing tendencies on frontal collision standard are present:

1) In Europe the Parliament has given mandate to EEVC to review the present Directive on Frontal Collision (Deformable barrier, 40% overlap, impact speed, some geometrical and biomechanical parameters).

2) In the USA the Congress has given mandate to NHTSA to go through a short/medium term activity to verify the possibility to finalise a standard which could be harmonised with the European standard.
   Furthermore, a long term activity has been devoted to the development of a specific USA frontal impact test.

That being said, it was called up on the participants of the group to explain the research activities in the field of frontal collision.

PRESENTATION OF THE RESEARCH ACTIVITIES

NHTSA: the activity in progress devoted to the assessment of the different frontal impact procedures used in Europe and USA nowadays was presented. Such procedures are different in terms of impact speeds and barrier types and for the introduction, into the USA tests, of the 5 % female dummy.
The activity is carried out by using 3 vehicle samples (IHRA/afc-1).

Accordingly the research progress devoted to the develop of frontal impact test procedure, based on accidentological data, was presented (IHRA/afc-2).

EEVC: the offset frontal impact test development history, against a deformable barrier at 56 km/h, was resumed. Also the different working items of WG16 were displayed, which will be developed by WG16 to assess improvements/modifications to the procedure (IHRA/afc-3).

Therefore an EURO-NCAP program on frontal/lateral/pedestrian impact was presented: such program was produced through the collaboration of different European societies and it is involving also European consumer

associations. The frontal impact test has been carried out at 64km/h instead of 56km/h required by the European Directive (IHRA/afc-4).

JAPAN: gave out a complete accidentological analysis referred to the Japanese reality in order to remark which types and harmful impacts mostly occur (IHRA/afc-5).

CANADA: explained that an activity to assess neck lesions during frontal impact against stiff 0° barrier is in progress. Such research is particularly devoted to evaluate lesions with or without air-bag using a 5% female dummy (IHRA/afc-6).

DISCUSSION AND FUTURE ACTIVITIES ASSIGNMENT

During the discussion items and distinguishing characteristics of miscellaneous existing standards, on which activities are in progress, were pointed out.

On the base of such characteristics a board to define the main aspects was drawn. On each of these the participants of the group engaged theirself to develop specific activities and to give out results.

WORKING MATTER	USA	CAN	EEVC	J	AUS
Trolley	X				
Types of barriers	X	X			X
-stiff	x	x			x
-deformable	x	x			x
Impact angle	X				
Dummy	X	X	X		x
5% female	x	x			x
95% male	x	x			x
Impact speed	X	X	X		X
Performance criteria	X	X	X		
-footwell intrusion	x		x		x
-steering wheel intrusion	x		x		
-abdomen		x			
-arms		x			
Evaluation of Air-Bag performance	X	X			X
-Deployment time analysis and aftermath on results.		x			
Standard extension on vehicle of category N1.			X		X

At the end of the discussion the "American" approach (with mobile barrier) and the "European" approach (the vehicle against a fixed barrier), as discussion focal point on Harmonisation, was proposed by EEVC (Mr. Lowne).

Therefore the analysis and the way to cope the methodological assessment of advantages and disadvantages of the two alternatives was convened.

A draft board, which will be developed and completed afterwards, is reported hereunder:

Mobile barrier approach

Advantages	**Analysis method**
Mass effect assessment possibility	Test speed depending on vehicle mass during the test with fixed barrier.
Proper reproduction of vehicle pulse and of the energy involved	
Impact angle effect assessment	
Compatibility evaluation	Load cells on fixed barrier use
Disadvantages	
Complexity	Aligned tests realisation
Repeatability	
Plants capacity	Evaluation of trolley high speed capacity (about 120 km/h) in existing test premises.
Ground-vehicle interaction unproperly reproduced	

SHORT-TERM WORKING PROGRAM

The group scheduled the next meeting on march 98, which date will be convened between the chairmen of frontal impact and compatibility group.

In the next meeting the aspects concerning frontal impact and reported in the above board will be discussed in order to produce an interim report for ESV Windsor Conference.

In such view and with the purpose to capitalize the limited available resources, representants from USA, Canada and EEVC are warmly invited to send to the Chairman within the time limit documents which refer on the state of the art of research aspects on which they got assignment.

An annex with a list of classified documents is attached.

LIST OF CLASSIFIED DOCUMENTS

- IHRA/afc-1-Development of a Frontal Offset Crash Test Procedure (B. Park,R. Morgan, J. Lowrie)
- IHRA/afc-2-NHTSA's Development of a Frontal Offset Test Procedure Based on Crash Data (S.L.Stucki).
- IHRA/afc-3-Report of IHRA Activities WG on Advanced Offset Frontal Protection (R. Lowne).
- IHRA/afc-4-EURO NCAP crash test programme
- IHRA/afc-5-Road traffic Accident in JAPAN.
- IHRA/afc-6-AIR-BAG Aggressiveness Study (D.J. Dalmotas).

27/10/97

REPORT TO THE INTERNATIONAL HARMONISATION RESEARCH ACTIVITIES COMMITTEE FROM THE COMPATIBILITY WORKING GROUP

Nominations and Attendance

Countries nominated by the IHRA Committee were contacted to choose representatives for the IHRA WG. Initially some EU States joined the but then withdrew in accordance with the agreed policy that EU representation should be restricted to the Chairman, Secretary and two members of EEVC WG 15.

Japan delayed nominating delegates until the June meeting of the IHRA Committee in Washington so unfortunately missed the first Compatibility WG meeting. They did though attend the WG meeting in October 1997. Delegates from Australia and Poland have been nominated but have not yet attended any meetings. Canada attended the first WG meeting but not the second.

WG meetings were held in June and October 1997 with a third planned meeting in Madrid in February 1998.

So far no industry representatives have attended, but a member from JAMA is likely to attend the next meeting.

Co-operation With EEVC WG15

EEVC WG15 was in being before the IHRA Compatibility WG was set-up. Membership of WG15 includes representation from the US and industry. Hence all the currently active compatibility programmes report directly to WG15. There is therefore a problem in ensuring that both WGs can conduct their own business, as well as keeping all members up-to-date with developments

The suggested solution is to schedule three meetings to run consecutively for the IHRA and WG15 work. The first part being restricted to members of WG15, when matters concerning only the EEVC and EU contractual matters would be discussed. The second part would be with both WGs present when technical presentation, including those from industry and guest speakers, would be discussed. The third part would be for IHRA members to discuss progress over work and arrange for international co-ordination. This format could also be used if the IHRA meeting were to be held in conjunction with the US WG.

This proposal will be raised at the EEVC Steering Group Meeting on 20/21 November in Madrid.

Member's Positions

The USA has the most developed and extensive plans for compatibility research. The approach taken is based on studying accident statistics to determine the extent of incompatibility in the US vehicle parc, and then use computer modelling techniques to investigate the areas where changes to rule making could have the best effect on casualty rates. Work has also started on looking into possible crash test developments to improve compatibility. There is particular concern in the US about the high incidence of "light trucks and vans (LTVs)" and their incompatibility with conventional cars. There is further concern that current legislation concentrates on protecting the 50th percentile male. Tests are showing that the small female may be less well protected. There is concern over protecting the lower limbs and tests have shown that protection is lower in oblique impacts. Currently, investigations are being made into the use of a mobile barrier impacting a stationary car, using an angled approach.

The EEVC WG 15 has had three meetings and has started to investigate European accidents to try to quantify the incompatibility problems. A structural survey has been started to create a data base of the geometrical properties of new car models on the European market. The contract from the EU has now been placed and work plans are being developed. These will include a literature search, national and in-depth accident analyses, computer modelling and crash testing. The work is planned to start in 1998 and be completed in 2000.

The UK has an existing compatibility programme which has been running for two years. This will be used to support the work of WG15. To date, work has concentrated on trying to identify the characteristics which influence compatibility in car to car frontal and side impact collisions. Computer simulation modelling has been used to investigate the effect of varying the car's deceleration pulse shape on restraint induced injuries, in frontal impact. For side impact a parametric study has been started. This is looking at the effects of charging bullet vehicle geometry, stiffness, ground clearance etc.

Both Canada and Japan are prepared to contribute to the international work on compatibility but await the development of a work plan which they can take part in.

Prospects for Harmonisation

It was always envisaged that the working group would look initially at the effects of compatibility in the car field, but always making sure that any conclusions took account of the effects on other types of vehicle. However there is a clear difference in the types of vehicles in use in North America and in Europe. There may also be differences when Australia and Japan are studied more fully. In particular, the high incidence of LTVs in the US has relevance to compatibility. This variation in car fleets may require the IHRA group to consider a wider group of vehicles than was originally planned for the EEVC WG15 work, for Europe.

As well as modelling the car fleet, NHTSA are producing FE car models, some of which relate to cars on sale in Europe and which may be of use to the EEVC modelling work. This is to be led by TNO and will build on that already started by TRL.

Discussion has also started on the possibilities for harmonising testing methods. The US has in the past favoured a test using a static vehicle hit obliquely by a crash barrier on a trolley. However such an arrangement for frontal impact will be very demanding on the testing facilities, and could be ruled out on the cost of implementation. If there was to be such a limitation then work on defining the possible parameters needs to be done early in the project.

All participants have therefor been asked to consider now the kinds of tests they may want to specify to insure that international harmonisation would be a possibility.

Conclusion

The IHRA compatibility working group (WG) has been set to find a test method to improve compatibility between vehicles and to plan to complete this work by the ESV Conference in 2000. It is apparent that this is a very complicated area for rule making, where as yet the problem is far from being defined let alone possible remedies being in view.

Approaches to solving these problems are being attempted from very detailed modelling techniques to more simplistic investigation linked to trial and error procedures. It is not clear which techniques will produce the break-through or when this may occur. In the current situation is not very likely that this work will be complete by 2000.